THE VETERINARY RECORD

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888

No. 47. NOVEMBER 19, 1949 VOL. 61.

PAPERS PRESENTED TO CONGRESS, N.V.M.A.

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THE PHYSIOLOGY OF REPRODUCTION IN THE DOG

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There was a large attendance at the Hoare Memorial Hall, Church House, Westminster, for discussion of the second paper of the session held there on Friday, August 12th, 1949, this being on the interesting theme of the physiology of reproduction in the dog, by Mr. Hancock and Dr. Rowlands.

The chair was occupied by Mr. CHARLES A. FODEN, M.R.C.V.S., of Petersfield, Hants., who, because the meeting (which had been preceded by discussion of Mr. Anderson's paper) was running behind the time-table, briefly introduced Dr. Rowlands (who spoke first) informing his audience that Dr. Rowlands was from the Agricultural Research Council and was well known throughout the world for his work on the physiology of reproduction, especially that on enzyme action in fertilisation. Mr. Hancock did not speak until the end of the discussion, when the Chairman emphasised that his work at Frant was particularly interesting to the general practitioner because of its essentially clinical nature and that it was doubtless well known to everyone present through his papers in *The Veterinary Record*.

In introducing this paper Dr. ROWLANDS suggested the existence of a relationship between heredity and infertility in different families of Airedales and instanced one family consisting of a bitch and seven of her daughters having a conception rate of 53 per cent. in comparision with one of 90 per cent. given by four other bitches and eleven of their daughters. He referred to the failure of vaginal smears to distinguish between pregnancy and pseudopregnancy and stated that these conditions could be distinguished with a high degree of certainty after the end of the fifth week by the persistence of vulval swelling in true pregnancy.

Protocols of natural—and stilboestrol—induced oestrous cycles were exhibited and discussed.

Following is the paper :

THE PHYSIOLOGY OF REPRODUCTION IN THE DOG *

The monoestrous character of the female reproductive cycle has secured for the dog a prominent place in histo-physiological studies but its significance for the veterinarian derives largely from problems of fertility which are posed by her restricted breeding season since failure of the bitch to concieve to mating in any one cycle will halve her reproductivity for the year. Under conditions of domestication the practice of restricting the free access of the dog to the bitch, itself tends to limit the chances of conception because of the long period of oestrus. These problems are obviously highly relevant to any attempt to breed dogs in a colony. This paper surveys the breeding performance of bitches maintained in this way and presents preliminary observations on methods adopted for the control of infertility.

Colony Management and Routine

The colony was founded in 1945 for the breeding of distemper susceptible puppies for use in investigating distemper-like diseases of the dog and in the testing of canine distemper prophylactics. It was established from a nucleus of six Airedale, two Foxhound and five mongrel bitches and one Airedale dog. Over a four-year period this has been expanded to form a stud of 45 bitches and a second Airedale and a Labrador dog have been introduced.

After a preliminary exploratory period, the diet finally adopted was based upon raw horseflesh and maize meal supplemented with dried yeast, cod liver oil and minerals. Adult dogs were fed at an approximate level of 5 gm. protein per kg. and 80 Cals. per kg. body-weight, while puppies were permitted about 15 gm. protein and 200 Cals. per kg. daily. The puppy diet included a supplement of fresh cows' milk for the first four weeks after weaning and bitches in late pregnancy and lactation also received an allowance of fresh milk with a double meat ration.

Bitches were examined daily by a kennel attendant for signs of vulval swelling and bleeding and their intensity recorded as marked (+++), moderate (++) or slight (+). Following the recognition of these symptoms, bitches were tried daily for evidence of sexual acceptance furnished by the bitch's "throwing" the tail and standing for the dog.

Vaginal smears were taken daily from the onset of bleeding until approximately four days after the termination of acceptance and then once weekly until parturition or the resolution of pseudopregnancy. Smears were prepared from material collected from the anterior vagina either by direct scraping or in saline suspension withdrawn with a pipette. Smears obtained by the first method were fixed and stained according to Papanicolaou (1933). Those stained by the latter were stained with Leishman.

A single examination for evidence of pregnancy was made originally during the fourth week after service. This was

* Presented to the Sixty-seventh Annual General Meeting and Congress of the National Veterinary Medical Association, in London, August 12th, 1949.

extended later to routine examinations at the end of the third, fifth and seventh weeks.

Techniques of semen collection and insemination were developed and are described later. Density estimations were made with a Fuchs Rosenthal haemocytometer, smears for morphological study were prepared from whole semen and stained with Heidenhain's iron haematoxylin after osmic fixation.

Oestrous Cycle

Onset of Sexual Activity and Periodicity of Oestrus

Data relating to the first occurrence of oestrus in 22 Airedale and 13 mongrel bitches born and reared in the colony are given in Table I showing that the onset of sexual maturity in the former tends to be slower than in mongrel types.

Table I

Onset of First Oestrus in Colony-bred Bitches

Age in May, 1949 (Months)	Number of Airedales		Number of Mongrels	
	Not seen in oestrus	Seen in oestrus	Not seen in oestrus	Seen in oestrus
9–12	4	—	7	2
13–16	—	2	—	4
17–20	—	4	—	—
21–24	3	6	—	—
25–28	2	—	—	—
29–32	—	1	—	—

The age at onset of oestrus in four mongrel litter-mates was 12 to 14 months while the ages of sexual maturity within members of an Airedale litter ranged from 18 to 24 months. Three other Airedale litters in which the earliest recorded oestrus was 15, 19 and 20 months respectively contained members that have failed so far to show " heat " at the ages of 21, 23 and 27 months respectively.

Table II records the number of oestrous cycles that occurred in each month for a two-year period beginning June, 1947.

Table II

The Seasonal Occurrence of Oestrus

Month	June	July	Aug.	Sept.	Oct.	Nov.
Number of cycles	5	11	5	2	2	8
Month	Dec.	Jan.	Feb.	Mar.	April	May
Number of cycles	8	5	4	4	5	4

The absence of any large concentration of cycles in the spring and autumn months suggests that the twice-yearly occurrence of oestrus in bitches kept in truly domestic conditions is not observed in animals maintained together in a large colony. In 20 bitches oestrus has recurred at intervals given in Table III. The bleeding and " heat " periods being on the average three to four weeks (see Table V) the interval between the end of one cycle and the beginning of the next (*i.e.*, inter-oestrous) can be assumed to be about one month less than the figures given in Table III.

Table III

Intervals Between Succeeding Cycles

	Periods between onset of cycles (months)						
	5	6	7	8	9	10	11
Number of cycles	3	5	10	11	5	1	4

The recurrence of oestrus in five bitches each of which had experienced three or more cycles is recorded in Table IV which shows that only one animal presented a uniform pattern of periodicity.

Table IV

Periodicity of Oestrus in Individual Bitches

Breed of bitch	Periods between onset of cycles (months)				
Foxhound	10	9	8	7	
Mongrel	9	6	8		
Mongrel	5	7	5	7	5
Airedale	6	9	7	7	8
Airedale	8	8	12	9	

Vaginal Cycle and Oestrous Behaviour

The overall periods of vulval bleeding and " heat " and their component lengths are shown in Table V.

Table V

Duration of External Bleeding and " Heat "

Breed	No. of cycles	Total bleeding and " heat " periods (days)		Bleeding (pro-oestrus) (days)		Heat (oestrus) (days)	
		Mean	Range	Mean	Range	Mean	Range
Airedale	19	23	17–41	12	5–27	10	6–14
Foxhound	11	18	13–26	5	2– 7	12	6–16
Foxhound x Airedale	4	28	18–33	9	8–12	12	10–14
Mongrel	22	23	12–35	9	4–14	12	7–24

The discrepancy between the overall period and the sum of its component parts is due to the persistence of bleeding beyond the end of " heat " in many bitches. In the four Foxhound-Airedale cross matings it is of interest to record that the only fertile mating occurred in the one cycle from which this prolonged post-oestrous bleeding was absent. The Airedales and mongrels which are of comparable age give no indication of a breed variation in cycle length. The greater cycle length of the Foxhound-Airedale cross in comparison with that of the pure Foxhound may be associated with a difference of age, the former being young bitches while the latter group contains six old bitches cast from hunting kennels. The shorter period of pro-oestrus in the Foxhounds similarly may be related to their age.

Seven atypical cycles in five bitches have been observed. In all these cycles the overall duration of external bleeding was within normal limits but in three (Airedales) the period of " heat " was interrupted (split oestrus). Two of these bitches showed an initial two-day period of acceptance followed by five days of non-acceptance at the end of which acceptance was resumed for nine and eleven days respectively.

The third showed three short periods of acceptance lasting two, one and two days each and separated by period of non-acceptance for one and seven days respectively. In two of these three cycles the duration of pro-oestrus was less than one-half that of the average cycle (see Table V). In the remaining four cycles (two bitches) oestrous behaviour was never manifest. The problem of mating these animals is discussed later.

The qualitative changes in the vaginal smear during the oestrous cycle have been described by Evans & Cole (1931) and Griffiths & Amoroso (1939) and in general their observations are confirmed. Broadly, the smear in pro-oestrus contains nucleated epithelial cells, cornified epithelial cells, red blood cells and leucocytes. The onset of the acceptance period is heralded by the disappearance of nucleated epithelial cells and leucocytes so that the smear during oestrus contains only red blood cells and cornified epithelial cells. The end of the acceptance period is marked by the re-appearance of large numbers of leucocytes and replacement of the cornified cells by young nucleated epithelial cells. The number of red cells is extremely variable throughout the cycle but tends to diminish during oestrus. Not infrequently, at the end of acceptance, there appears to be a resumption or reinforcement of bleeding which persists into met-oestrus.

Forty-two cycles have been studied and 34 clinically normal cycles have conformed to the general histological pattern described above. In only four of these cycles was acceptance noted before the completion of cornification. Twenty bitches accepted within three days of the completion of cornification and of the remainder, nine exhibited complete cornification for periods of four to eight days before acceptance. One bitch, in which oestrus followed the administration of stilboestrol dipropionate, did not accept until the 11th day of cornification. There was a close correlation between the end of the heat period and the reappearance of leucocytes in the smear. In two cycles only did the termination of acceptance precede this cellular change. In 26 the period of acceptance after the advent of leucocytes in the smear was less than four days. The remaining six bitches continued to show heat for periods of four to eight days. Though these records are based upon the first appearance of leucocytes it should be emphasised that the complete cellular pattern of met-oestrus is not evident until two or three days later.

The histological studies covered three cycles in which acceptance did not occur and in one the cellular changes followed a normal sequence. The other two were noted in one bitch; in her first cycle cornification was complete for two days only and in her second it was never complete. Although this bitch's third cycle conformed to the normal clinical pattern, cornification was observed only on the first of a nine-day acceptance period. Two of three bitches which exhibited "split oestrus" showed histologically normal vaginal changes but in the third the first period of acceptance (two days) occurred before the completion of cornification. Leucocytes persisted in the vaginal smears of three bitches throughout their periods of acceptance.

Mating and Conception

Guided by the observation of Evans & Cole (1931) and Griffiths & Amoroso (1939) on the occurrence of ovulation in relation to oestrus in the bitch, we have related mating to the onset of acceptance (oestrus) rather than to the onset of external bleeding (pro-oestrus), which is the breeder's usual practice. The relationship of mating time to oestrus has been studied in 55 cycles in seven of which the bitch was mated once only. Six mated before the sixth day of oestrus conceived; one mated on the sixth day proved barren. Two or more matings at intervals of at least 48 hours were permitted at each of the remaining 48 cycles and the results are given in Table VI.

Table VI

Conception in Relation to the Time in Oestrus of First Mating

	Day in oestrus of first mating					
	1	2	3	4	5	6
Number of cycles	28	8	9	5	3	2
Number of conceptions	21	7	9	5	2	1

It is concluded that a very high probability of conception will occur if the first mating is permitted during the first four days of oestrus and is followed by a second 48 hours later, and there is a suggestion that fertility may be lowered by withholding service until the fifth day of oestrus. This statement confirms the observation of Griffiths & Amoroso (1939).

Thirty-two bitches mated over 55 clinically normal cycles resulted in 45 pregnancies, giving a conception rate of 82%. Of the ten infertile cycles five were recorded in nulliparous bitches and three in one mongrel bitch. The mean duration of oestrus in ten cycles in which conception did not occur was 14·5 ± 1·3 days and was significantly longer than that (10·4 ± 0·4 days) of the 45 fertile cycles. As can be seen from Table VII, no significant difference exists between the pure-bred and cross-bred groups.

Table VII

Fertility in Different Breeds

Breed	Number of bitches	Number of cycles	Number of pregnancies
Airedale	13	19	17
Foxhound	8	11	9
Cross-bred ...	11	25	19

Pregnancy and Pseudopregnancy

Histological Changes

The leucocytes, which reappeared in the vaginal smear at the end of oestrus, remained prominent during the first month of pregnancy and thereafter their numbers markedly decreased. At the fourth week the smear was of the pro-oestrous type containing large numbers of small nucleated epithelial cells and others undergoing cornification. This process was continued during the latter half of pregnancy but the smears did not contain the cellular debris characteristic of the oestrous vagina. Nevertheless, the degree of cornification was greater than that observed at any time other than at oestrus. Mucus occurred in abundance during early pregnancy but disappeared with the advent of cornification at mid-pregnancy.

Preliminary observations failed to recognise any distinct differences in the cellular content of smears taken during pregnancy and pseudopregnancy.

Clinical Changes

Initial attempts to diagnose pregnancy from a single examination made during the fourth week after service were abandoned when it was found that only four of six barren bitches were recognised. The adoption of three examinations

at fortnightly intervals from the end of the third week also indicated (see Table VIII) that the recognition of uterine distension at three and five weeks after service was frequency contradicted at the third examination. Thus, of seven bitches recognised as barren at seven weeks, five had been regarded as pregnant two weeks earlier.

TABLE VIII

PREGNANCY DIAGNOSIS

Stage examined (weeks after service)	Number examined	Number barren	False positives	False negatives
3	34	6	2	0
5	39	11	8	3
7	27	9	1	0

As barren bitches showed a clinically distinct degree of uterine development during the first five weeks after service, with a rapid involution at about the sixth week, it was considered that an early pregnancy may have been terminated by foetal resorption, but confirmatory evidence was not furnished by hysterotomy performed on a single bitch 55 days after service and seven days after the recognition of uterine involution. It was concluded that the limitations of the clinical method were imposed by uterine changes associated with pseudo-pregnancy although in no case were any of the classical signs of mammary growth and lactation observed Our experience suggests that any diagnosis formed during the first five weeks after service should be tentative and await confirmation during the seventh week.

In defence of the observer's clinical ability it may be said that identification of any unserved anoestrous bitches included as controls in a group of animals submitted for pregnancy diagnosis, presented no comparable problem.

Length of Gestation

In three Airedales that conceived at single matings, the interval between mating and whelping was 60, 61 and 63 days respectively and in three mongrels, similarly mated, the intervals were 61, 64 and 66 days. These values all lie within the normal range (Kenneth, 1947). As the majority of bitches were mated on two or more occasions during a single cycle the difficulty arises of determining the fertile mating from which the gestation period can be calculated. This difficulty has been overcome by grouping, on the one hand, bitches in which the intervals between mating and gestation did not exceed 63 days and, on the other hand, those in which the shortest intervals were 64 or more days. A number of bitches in which the mating-whelping intervals could not be segregated into either of these groups have not been included in Table IX.

TABLE IX

GESTATION PERIOD IN DIFFERENT BREEDS

Breed	Maximum 63 days	Minimum 64 days
Foxhound	1	4
Airedale	12	1
Mongrel	3	6

The above figures show that when calculated on this basis the gestation period of the Airedale is significantly shorter than that of the foxhound and the mongrel.

Litter Size and Viability

A summary of the records of 29 bitches that yielded 58 litters is given in Table X showing that litter size in the Airedale, Foxhound and mongrel groups was closely similar.

TABLE X

LITTER SIZE AND VIABILITY

Breed	No. of bitches	No. of litters	Average litter size			Live births Per cent.	No. of pups reared Per cent.
			Total	Live-born	Reared		
Foxhound	2	8	7·4	7·1	3·1	97	43
Airedale	17	31	7·5	7·0	4·7	94	62
Mongrel	10	19	7·6	7·4	4·8	97	64

Litter size and the proportion of live births was high in the three groups but pup viability was low, no breed differences being observed. The great majority of deaths occurred within the first week and in no instance could death be attributed to the bitch's failure to lactate. It is clear, therefore, that the high neo-natal death-rate is one of the major problems attached to breeding of dogs under these conditions.

It was observed frequently that the deaths amongst pups born in the autumn and winter were more common than they were in more favourable seasons of the year. Accordingly, the data given in Table X were assembled to examine the variation in mortality rates shown by litters born in the two periods April to September and October to March. It was found that ten of 27 litters born during spring and summer were reared without loss of life and that during the autumn and winter only four of 31 litters were reared completely. Further information is given in Table XI which suggests that there is a lower survival rate within litters born during autumn and winter and that this may be related to the larger litter size noted in these two seasons.

TABLE XI

SEASONAL VARIATION IN LITTER VIABILITY

Season of whelping	Number of litters	Average litter size		Total pups		
		Born	Weaned	Born	Weaned	%
April-Sept.	27	6·7	4·7	182	126	69
Oct.-Mar.	31	8·1	4·4	253	136	54

Despite the suggestion of a seasonal variation in litter viability, the effects of restricted diet and environment were also considered and the possibility of infective agents being incriminated was explored. Although experience showed that the basic ration outlined above was wholly adequate for body growth and maintenance, it was considered possible that the demands of pregnancy were not being fulfilled. The cod liver oil and dried yeast supplement appeared to dispose of any possible deficiency of vitamins A, B or D. Although it is generally considered that the dog is independent of exogenous vitamin C, the diet of some pregnant bitches was supplemented with this vitamin and with vitamin E and preliminary observations on the results are presented below.

It was considered that adverse psychological effects of the restricted environment may have been responsible for a depression of maternal instinct. The breeding performance of bitches permitted free access to an exercise run and given

complete privacy from the time of mating is being compared with that of others whelping at the same time under the normal conditions in a communal kennel, segregated only by partitions and being exercised only on the lead. The superiority of the first method, as yet not established, has been suggested by the performance of individual bitches which have whelped in quarantine.

The possibility that the high neo-natal death rate might be of an epizootic nature suggested the institution of the bacteriological survey which was undertaken to identify bitches harbouring haemolytic streptococci in the genital tract and to investigate the significance of this organism as a relevant epidemiological factor. This survey included bacteriological examination of a single vaginal swab from each bitch taken during the second half of pregnancy and of pups stillborn or dying with the mother. The tissues examined from pups were heart blood, liver, spleen and intestinal contents. Surface cultivation of all material was carried out aerobically on 5 per cent. horse blood agar plates. After 48 hours' incubation, suspect colonies were picked into broth and their Lancefield group classification determined after morphological identification. Swabs from 33 bitches were examined and Group G streptococci recovered from 20. Eighty-four of 150 pups born to the 20 positive bitches and 52 of 90 pups born to negative bitches were weaned. These uniform survival rates (56 and 58 per cent.) would appear to suggest that the organism is of little significance as a factor in pup mortality, but it must be pointed out that plate contamination may have masked the presence of streptococci in cultures recorded as negative so that some carrier bitches may have escaped identification, and the number of non-carriers may have been proportionately less. There is, however, no doubt that the organism was widespread throughout the stud and further evidence of its significance must be sought in the findings on the pups. Sixty-one pups which died within 72 hours of birth were examined bacteriologically and Group G streptococci were recovered from eleven. Twelve of the pups examined were from bitches which had yielded the organism at swabbings made within three days of parturition and only two of the eleven positives were found in this group. The eleven positive pups were from six litters in which the total number of deaths in the first 72 hours after birth was 34 pups. None of seven of these, which died in the first 24 hours, yielded streptococci.

There is little evidence therefore to suggest that the juvenile death rate was due to infection with streptococci derived from carrier dams. It would appear, rather, that low pup viability was determined by other factors and that invasion of the tissues with streptococci when it occurred was a secondary change but one of possible significance.

The Control of Infertility in the Bitch

It has been shown that breeding efficiency in our colony is reduced by two main factors, (*a*) delayed onset of puberty and the irregular periodicity of the oestrous cycle and (*b*) the low viability of the newly-born pups. Experiments designed to find means of controlling these factors are described below.

Induction of Oestrus

The induction of oestrus by the application of gonadotrophic and oestrogenic substances has been investigated.

Eight maiden bitches 13 to 16 months old which had failed to show " heat " were injected subcutaneously with 200 to 300 i.u. of P.M.S. given as a single dose or as divided doses of 100 i.u. at four-day intervals. No clinical response was observed and unilateral ovariectomy performed on two bitches within a month of treatment failed to supply any evidence of ovarian stimulation. It is of interest to record that both these bitches came into " season " within a period of seven weeks after the operation. One of them conceived to a single insemination and whelped nine puppies which were reared uneventfully. The second bitch whelped five puppies, one of which was stillborn ; the remainder were reared. The onset of oestrus in these two bitches may be evidence of a compensatory hypertrophy of the remaining ovary.

In one of two parous bitches treated, the injection of 200 i.u. P.M.S. was followed seven days later by pro-oestrous bleeding of nine days' duration and mating on the fifth day of acceptance was successful. The second bitch showed no clinical response to a total dosage of 2,250 i.u. of the hormone.

During the past 18 months four small groups of bitches have been given a course of intramuscular injections of stilboestrol dipropionate, in amounts of 0·05 mg., 0·1 mg., 0·2 mg. and 0·5 mg. at intervals of four to five days and in the absence of any visible response a further 2 mg. were injected 14 days later. When a response induced by 0·5 mg. appeared to demand reinforcement this was attempted by the injection of 1 mg. after an arbitrary interval.

The varied types of response in 28 bitches are classified below :—

(*a*) *No Response.*—Five bitches, all of which were sexually immature and about one year old when injected in May, 1949, failed to elicit either vaginal bleeding or vulval swelling.

(*b*) *Initiation of Pro-oestrus Only.*—In nine bitches pro-oestrus was induced for a period of one to three days after which vulval swelling receded and bleeding stopped. These animals were from 15 to 27 months old and had never been in oestrus previously.

(*c*) *Induction of Pro-oestrus and Oestrus.*—Pro-oestrus and oestrus followed treatment in the remaining 14 bitches of which nine were parous, one sexually mature but nulliparous and four maiden bitches 20 to 27 months old. As a general rule vulval bleeding and swelling began within four days of the last injection of stilboestrol. Two bitches began to bleed after the injection of 0·1 mg., three commenced after an injection of 0·2 mg., three bled after 0·5 mg., four after 1 mg. and two after the maximum dose (2 mg.) was injected. The duration of pro-oestrus in all these bitches was within normal limits, but oestrus tended to be more variable in length. The results of matings are known for eight of the bitches. Five bitches whelped a total of 33 puppies of which 18 were weaned. The gestation period was of normal duration in all except one Airedale bitch which received the final 2 mg. dose and presented an atypical cycle. Within six days of the final injection the vaginal smear was of the oestrous type and three inseminations were made in the absence of acceptance, this being manifest for four days only, beginning eight days after the last insemination. Mating was not permitted. The insemination to whelping intervals were 75, 73 and 69 days' duration : three mongrel type puppies were born indicating that conception probably resulted from the second insemination. The extremely long gestation period may well have resulted from a temporary " tube-locking " action of oestrogen which interfered with the normal rate of passage of the fertilised ova through the Fallopian tubes and delayed subsequent implantation. An alternative explanation may be found in the long period of sperm viability.

Summarising these results, it can be seen that whereas the complete cycle was induced in all nine parous animals, oestrus occurred in only five of 18 maiden bitches. They suggest that stilboestrol can be used to accelerate the onset of oestrus in parous bitches when " heat " has been delayed.

Enhancement of Litter Viability

Last autumn, in an attempt to investigate the effects of supplementation of the diet with vitamin E, every alternate bitch received by mouth one tablet of 3 mg. α-tocopherol acetate daily from the time of mating throughout pregnancy and lactation. The bitches (six treated and five controls) were maintained in indoor kennels and all whelped between December, 1948, and March, 1949. The results of treatment are summarised in Table XII.

Table XII

The Effect of Vitamin E given Daily Throughout Pregnancy

Treatment	No. of bitches	No. of pups born	No. of live pups born	No. of pups weaned	Proportion of pups reared per litter %
Vit. E (3 mg.)	6	51	46	30	63
Controls	5	44	38	14	37

The difference between the absolute numbers of puppies born and reared in both groups is significant, thus indicating a beneficial action of vitamin E during pre-natal life. Though the proportion of puppies reared per litter in the two groups also favours the above contention the number of bitches treated is not sufficient to prove that the difference is significant.

The action of vitamin C, given similarly at the rate of 50 mg. ascorbic acid per day, is being investigated but no results are yet available.

The Male

There was some variation in behaviour shown by the three dogs in natural service. The senior Airedale when first used at two years old showed little sexual desire until after the intramuscular administration of 200 i.u. chorionic gonadotrophin. He has since been in regular service but has continued to display strong preferences for individual bitches and shows no interest in bitches in late pro-oestrus and early met-oestrus.

The Labrador has maintained a high degree of sexual vigour since his introduction to the stud at 17 months old and does not discriminate so rigidly against bitches not in full oestrus but retains certain individual preferences. The second Airedale showed normal sexual desire at 27 months old when purchased and has worked regularly after acquiring the experience apparently needed to overcome a preliminary phase of impotence.

Semen Collection

The three dogs used for stud purposes have all been successfully introduced to artificial service and the observations recorded below are derived from studies on their semen.

Semen was collected with a Cambridge pattern ram artificial vagina modified by turning over each end of the metal jacket a short cuff of bicycle " inner tubing " which served to protect the latex liners from wear and by forming a semi-rigid rubber ring for 1 or 2 inches within the jacket, cushioned the entrance to the instrument. For collection the jacket was filled with water heated to give an internal temperature of 42° to 44° C. To simulate the dry vagina of the oestrous bitch no lubricant was used. Collection was carried out using a bitch in heat as a teaser. With an attendant on the left side at the bitch's head and the operator on the right, the artificial vagina was held between the hind legs of the bitch, from in front, so that the entrance to the instrument lay below the vulva. The dog was allowed to mount without restraint and the penis grasped within its sheath immediately behind the bulbs with the left hand. Directing the penis towards the opening of the artificial vagina, vigorous copulatory thrusts were then elicited by constriction of the penis behind the bulbs. After an interval of about one minute the bitch was removed and collection completed by extending the penis backward into the usual late coital position, maintaining it within the instrument by sustained pressure behind the bulbs. Not uncommonly this was unnecessary in the case of the smaller Labrador dog owing to a spontaneous locking of the bulbs within the artificial vagina.

Examination of Semen

Twenty-two collections were made from the three dogs. It was observed during collection that there were marked variations in the density of the different fractions of the same ejaculate, the first fluid collected being water clear, while the later fractions showed a gradually increasing density, acquiring the appearance of a dense white opaque fluid which sank in the collecting vessel below the level of the clear secretion and then gradually diffused throughout to produce a thin translucent suspension. Estimations carried out on 19 ejaculates gave a mean density of 275,000 spermatozoa per c.mm. with a range of 62,000 to 640,000. The volume of ejaculate showed a similar degree of variability. The mean volume for nine recorded ejaculates was 6·5 ml. with a range of 2 ml. to 17 ml. and in general volume varied inversely with density. Ejaculates of average density showed a vigorous wave motion on microscopical examination. The motility of the individual spermatozoa was of a very high order and it was estimated that the proportion of dead did not exceed 20 per cent. of the whole, in average samples. The mean percentage of abnormal spermatozoa found on morphological examination of eleven ejaculates was 4·8 with a range of from 0 to 10.

Insemination

Insemination was carried out by introducing 1 ml. to 5 ml. of semen with a pipette into the anterior vagina. The volume of inseminate was an arbitrary one dictated by the volume of semen available and the number of bitches to be inseminated. The operation was performed with the hind quarters of the bitch raised to bring the vagina into a vertical position. A " Pyrex " test tube was adapted to form a simple speculum with an oblique opening at one end. This was lubricated with sterile soft white paraffin and manipulated over the ischial arch until the semen could be deposited into the depth of the vagina. The speculum was withdrawn carefully to prevent the collapsing vaginal walls from expelling the inseminate and the bitch was immediately released.

Eight bitches have been inseminated covering nine cycles. In five cycles the time of insemination was selected from a study of the vaginal smear without reference to trial with the dog and three litters were born. Two of the remaining four bitches whelped. Twenty-five pups of a total of 28 born were weaned.

References

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Discussion

Professor E. C. Amoroso (The Royal Veterinary College), who was the first opener of the discussion, said:—

The two investigators, the discussion of whose paper I am privileged to open, have outlined their interpretation of the biological backgrounds conditioning and controlling the breeding habits of the domestic dog, and they have indicated the techniques they have employed in that investigation. Now of the very many inferences which might be drawn from these observations not the least important is that which gives pertinence to the dictum that all ascertainable truth is piecemeal, partial, uncertain and difficult. In other words, while significant advances have been made in our knowledge of the reproductive habits of female mammals, there are, as yet, many imperfectly understood phenomena, despite the most intensive study of a host of American and European workers.

These difficulties and imperfections apply with special force to the dog, for in this animal the pattern of reproduction presents features which differ not only from the other Carnivora but also, I think, from most other mammals. These considerations suggest, therefore, that a certain modesty and cautious reserve will be the part of wisdom in opening this discussion. Consequently if, in what follows, any irregularities of emphasis are observed, I would ask my audience to ascribe them as much to my own limitations as to the time at my disposal.

In their reproductive habits the dog and possibly other *Canidae* such as the fox differ markedly from the cat, ferret and other felids and mustelids. In the former, ovulation is spontaneous and occurs early in oestrus, and the animal continues in heat for some time after ovulation. In the latter group, on the other hand, ovulation is not spontaneous but follows copulation or some comparable stimulus, and heat is terminated about the time of ovulation.

Moreover, the relationship between the time of ovulation and heat in the dog differs from that in other spontaneously ovulating mammals. In almost every mammal of this type for which data are available, ovulation occurs during the second half of heat, if not near the end. Yet in the dog the temporal relations are different, ovulation is more nearly related to the beginning of heat and heat continues for a week or more, as was shown by Bischoff more than 100 years ago. The implication is that the heat-inducing mechanism in the dog is different from that in other spontaneously ovulating mammals, a fact which might be responsible, I believe, for the variations in mating behaviour when replacement therapy has been employed.

Morphological evidence has been presented, which would seem to indicate that oestrogens alone have been sufficient to induce heat in the dog. Nevertheless, such morphological studies do not preclude the participation of other endocrine factors in eliciting heat responses, even in those cases where oestrogens alone have been administered to the animal. Thus a mass of evidence is rapidly accumulating which suggests that in the guinea-pig and in the rat the appearance of heat marks the beginning of luteal activity and the secretion of progesterone. And the same may be true of the dog.

In the dog, Bischoff was the first to describe the folding of the follicle wall before ovulation and he believed that corpora lutea began to form before ovulation in this species. In my laboratory corroborative histological examination gives support to the correctness of Bischoff's conclusion, while biological essays attest to the probability of progesterone in the unruptured follicle. Accordingly, I am disposed to believe that in the bitch, by some mechanism which is as yet obscure, heat is stimulated by the conditioning action of oestrogens, followed by the secondary action (synergistic, if you like) of progesterone produced in the maturing follicle. This oestrogens-progesterone heat inducing mechanism is susceptible of proof or disproof, and it would be of interest to know whether it was effective in the spayed bitch.

Another approach to this problem has been through the study of the action of the gonadotrophic hormones and one of my colleagues, Mr. Willis, will report on the successful use of these hormones in inducing oestrous responses; his results are at variance with those of the principal speakers. These differences may, however, be related to the fact that in Willis's experiments the gonadotrophic hormones must have been administered in such a way that their normal manner of action on the ovaries were approximated.

The next point to which allusion should be made is that of reproductive wastage. The authors have rightly pointed out that one of the major problems in the breeding of dogs is the high neonatal mortality which reduces the live births by almost 50 per cent. This reproductive wastage has been shown to be in part seasonal, but it might well be that it is also governed by hereditary factors and by focal deficiencies in the nutritional status of the young at birth. It is known, for example, that faulty nutrition and environmental factors, which acting upon the mother produce a differential mortality between males and females, result in a preponderance of stillborn and aborted males. Moreover, it is also known that the metabolic requirements of the male are greater than those of the female and it has been suggested that this is the cause of the higher mortality of male embryos. Nutrition may thus have an influence on characteristics of progeny subsequent to fertilisation, and it would be of interest to know whether this selective elimination is projected into the neonatal period.

Another important question pertains to the extent of prenatal mortality in the dog. By comparing the prolificacy of the ovaries with the number of normal eggs or conceptuses at any stage in pregnancy, a measure may be obtained of the extent to which eggs are eliminated by loss, death or defective fertilisation. In pregnant greyhounds about 10 to 15 per cent. of all ovulated eggs are so eliminated. This represents a substantial wastage, yet, and this is a point especially to be emphasised, very little has been done in the way of attempting to analyse thoroughly and penetratingly the biological effects of *in utero* environmental conditions upon the reproductive capacity of the dog. This statement is from the necessity of brevity, much too bald and apparently dogmatic in its form, and wants more explanatory elucidation and development than I can give it here. But it essentially conforms to at least a part of the reality.

Mr. R. E. Williams, B.V.Sc. (Liv.), M.R.C.V.S., of Southampton, who was the second opener of the discussion, said: There is perhaps no need to apologise for approaching this paper from the practitioner's point of view, and it may be profitable to consider what clinical problems are solved, posed, or ignored by it.

The success or failure of dog breeding is of vital concern to the small-animal practitioner, and to say that the breeder is to-day beset with difficulties is an understatement.

Problems of infertility at the moment are very much overshadowed by the "enfant terrible" of the virus family, whose distressing habits have caused practitioners and breeders to cast very jaundiced eyes upon the prospect of keeping any dog alive long enough to enjoy a worth-while show and breeding career. However, recent more optimistic pronouncements from the pundits may justify us in reflecting that viruses, like men, may come and go, but that infertility—at least an eddy in the stream of life—goes on for ever.

At the very outset one is surprised by the contents of Table I. Out of a total of 35 bitches, only two came into season within their first year—the majority from 18 months onwards. It is true that delayed onset of first oestrum—even up to three or four years—is a not infrequent individual problem, but I have never come across a group of dogs exhibiting such tardiness in practice. This cannot be considered normal and would not be viewed with complacency by any breeder.

Of domesticated bitches kept singly or in small breeding groups, I believe it is certain that in a vast majority the onset of oestrum falls between seven and 12 months. I had an impression that the operative factor here was a relationship between the month of birth and the onset of spring and early summer. In other words, a puppy which arrives at the age of six months in the autumn or winter will in all probability not come into oestrum until the following spring, and will thus be around 12 months old, whereas a puppy born in June, July or August is likely to be in oestrum the following spring at from six to eight months of age. Perhaps this is over simple—and one must not overlook the effect of a conscious attempt by breeders to concentrate their breeding operations into the more favourable summer months in creating an apparent seasonal peak of oestrual activity.

Why this very late onset of oestrum should be so marked in this colony makes interesting conjecture. An insufficient diet is the first thought—particularly the protein level. I have to confess

that I cannot conceive quantities in terms of kilograms, but taking a chance with my mathematics, I calculate that an adult dog weighing, say, 50 lb. would receive around ¼ lb. of meat daily and a puppy weighing 20 lb. something less than ½ lb. daily. I hope I have not misrepresented the facts, but if these figures are correct I am sure that this level of protein intake is considerably below the general level achieved by private breeders of large dogs. A significant factor would seem to be the age at which a puppy becomes officially an adult in these kennels, and is subjected to the cut in protein intake. It is unwise to dogmatise about essentials in a dog's diet—I know of one terrier that has thrived for years on an exclusive diet of boiled water and slippery elm food—but the only group of dogs of which I have experience, where pups are reared to maturity and bred under conditions of monotonous and unvaried diet comparable to those under consideration—is a local foxhound kennel.

There are two differences which may be significant:—

(1) The sexes are not segregated normally.

(2) Although the diet contains no supplements except cod liver oil in winter time for the youngsters, the hounds have access to grass all the year round and do in fact eat considerable quantities of it.

In this kennel there has never been any problem of delayed onset of first oestrum, and this year six parous bitches had 100 per cent. conception rate to first matings. Out of 46 pups born 45 were reared to culling age. I have always regarded the interval between cycles as extremely variable and I think it might be profitable to sidestep this by abandoning the conception that a six-monthly cycle is normal. Of records available to me in a kennel of racing greyhounds only one bitch out of 13 had a regular six-monthly cycle; of the others seven to nine months was usual. These, of course, were all nulliparous animals.

In the same kennel of foxhounds, several nulliparous bitches exhibited split oestrum this year—exhibited an apparently normal oestrum, became quiescent, and later recommenced vaginal bleeding for a further period of ten days to a fortnight. The huntsman, an experienced breeder for many years, had never encountered this before, but in reality it is a common enough phenomenon, and rarely calls for clinical interference. The fact that the term "false heat" is common jargon in the vocabulary of breeders and greyhound trainers is sufficient evidence of its prevalence.

All these irregularities, however, do not add up to much of a clinical problem, and a knowledge of the physiological mechanism and the vaginal smear interpretation should enable the practitioner to circumvent any effect on fertility in specific cases.

The breeder's and hence the practitioner's chief problems may, I think, be categorised as follows:—

(1) The unwilling, so-called "shy breeder."

(2) The differential diagnosis of pseudo and actual pregnancy at a usefully early stage.

(3) The occurrence of an overlong gestation associated with some degree of primary uterine inertia and a high proportion of still-born whelps.

(4) Early death of pups born at least technically alive.

(5) Lack of adequate maternal instinct associated frequently with lack of milk.

The road to the solution of the first two problems is adequately pointed in the paper. The fashionable system whereby dogs are maintained at public stud, necessitating a visit by the bitch on a rather arbitrarily chosen day, must militate seriously against conception, and particularly for the maiden bitch the psychological factors involved in strange surroundings, controlled mating, etc., are bound to tip the scale heavily.

Having achieved our mating, however, it is reassuring to know that the diagnosis of pregnancy can be difficult for the honest man—however expert—and here as in all manipulative techniques, practice allied to understanding may raise the standard of accuracy very greatly.

My third and fifth categories are not directly considered in the paper, so they had better be left underlined as worthy of future investigation.

The remaining category, the early death of pups, seems to me to be the hard core of the whole series. Here we come up against the old controversy of the *Betahaemolytic streptococcus* syndrome. For the past ten years, at any rate (I am speaking only of my own experience), this condition has proved a severe and continual headache to small-animal practitioners. That it can assume devastating proportions in a geographical area, simulating an epizootic and even forcing breeders to "shut up shop," is common experience, at any rate, in the southern half of England. Our very eagerness a few years ago to grasp the suggestion that a few doses of vaccine would solve the problem, is surely a measure of our concern. Results similar to those published to-day, however, from investigations carried out privately and otherwise, have led us gently back to a more critical viewpoint. The authors of this paper have shed no new light on this problem, but their results with vitamin E seem to merit attention as being of some significance, although my own experience during the war years produced no comparable results. While it must evidently be considered, it is very difficult to believe that diet could be a very significant factor in some of the old-established and well-run kennels which have been stricken—fortified as they often were by every likely potion their V.S. could lay his hands on.

Another possibility, I suppose, must be the inheritance of some lethal genetic factor, which might provide an alternative explanation for the trail of woe which appeared to follow specific stud dogs and which was previously interpreted as a spread of venereal infection. As against this, the occurrence of the condition in many breeds, which must constitute almost watertight genetical compartments, seems hard to explain. This, however, is pure speculation, for which I am less qualified than the authors of the paper, and I think the time is propitious for a plea for a concerted effort to solve this problem.

The induction of fertile oestrum in maiden bitches has always been difficult, and is occasionally a clinical problem. As far as I can recollect, my results have been uniformly negative—which is perhaps not surprising in view of the heroic level of dosage which it has been customary to use of gonadotrophins and oestrogens. We have been shown that success is possible, although the paucity of successful results may mean that spontaneous ovarian activity was commencing in the animals in which a response was achieved. It is unfortunate that the ovaries of the bitch are so inaccessible. On the other hand, I can recall several brood bitches which have remained sexually inactive for disastrously long periods following the use of large doses of stilboestrol as a contraceptive agent. At present a satisfactory solution is not in sight, but evidence as to the more rational use of these most potent therapeutic agents would be welcome.

Impotence in the male as a clinical problem is regularly encountered. A young dog who wins his spurs in the show ring often becomes in demand at stud overnight. His ineffectualness may be a source of considerable financial loss to his owner and loss of reputation to himself. This can generally be summed up as inexperience, but may be quite difficult to overcome.

At the other end of the scale is the stud dog, who is overworked or bored, and loses vigour or becomes unduly selective. The old breeders' maxim, that a stud dog should never be treated as a pet and should be kennelled alone, has the force of experience. The experienced stud dog of catholic tastes, who will mate anything offered to him without fuss or selection, is a "rare bird" and is valued accordingly.

It is evident that in the techniques of A.I. and interpretation of vaginal smears, we have in our hands two powerful weapons with which to combat functional infertility. Formidable though these techniques may appear to a practitioner, with his time severely rationed, it is encouraging to know that if the occasion demands it, it is in our power to rise to it.

The memory searching stimulated by reading this paper makes one very much aware that experience in this subject is largely composed of impressions and half-remembered data, which at the best is poor material to support a critical consideration. But the art of dog-breeding is cluttered with superstition and traditional mumbo-jumbo and will be greatly benefited by a cold douche of real understanding based on factual records such as we are discussing to-day. I hope that nothing will prevent this investigation being pursued to its ultimate ends and I congratulate the authors in their choice of this most neglected field.

General Discussion

Mr. G. A. Willis (Royal Veterinary College) mentioned, in connection with the induction of oestrum by means of gonadotrophic hormones, the case of two greyhound bitches, mother and daughter, recently investigated in the Animal Husbandry Department of the Royal Veterinary College. The mother was first examined in March, 1948. She was then seven years old, and had been in oestrum only on two occasions, at the age of 2½ years and 5 years. On each of these two occasions she had produced a litter. She had shown no sign of oestrum since last whelping.

In March, 1948, she was treated by the simultaneous intramuscular injection of 800 I.U. serum gonadotrophin (F.S.H.) and 100 I.U. chorionic gonadotrophin (L.H.), a method which had previous'y in some cases proved successful.[1] No clinical response was observed in this case as a result of these injections. In January, 1949, this bitch (now eight years old), still having shown no signs of oestrum, was again presented for treatment, together with one of her daughters from the first litter. The latter had come into "season" on only one occasion and was not then mated, although she was now five years old.

Each bitch was injected intramuscularly with 100 I.U. serum gonadotrophin each day until bleeding and vulval swelling was observed. These symptoms were seen in the mother after nine successive daily injections had been given. In the daughter bleeding and swelling occurred after eight such daily injections. In both mother and daughter pro-oestrum lasted seven days. On the first day after the cessation of bleeding the mother was given 500 I.U. chorionic gonadotrophin intramuscularly and mated two days later. Each bitch was mated once only.

The mother failed to conceive, but the daughter whelped seven puppies after 61 days' gestation.

The Replies

Mr. J. L. Hancock, in reply, said that he had been responsible for establishing the diet which was fed to the colony. It had been established after (what was, for a clinician!) considerable study of the theoretical requirements for growth, maintenance and lactation. Economic practice had had to receive consideration and to simplify the attendants' task the protein requirements for the maintenance of adult dogs had been met by permitting 1 oz. of raw horseflesh for every 10 lb. bodyweight. He recalled that the pup diet was designed to give approximately three times the protein allowance of adults and expressed the opinion that inadequate supply of protein was not the factor responsible for the delay in onset of oestrus, encountered in bitches, although he tended to agree with Mr. Williams that some nutritional factor was implicated.

In discussing further the differential diagnosis of pregnancy and pseudo-pregnancy, he referred to his own results illustrated in Table VIII, remarking that in the first group his clinical diagnosis had been correct in 32 out of 34 cases. He suggested that had he encountered this sequence in practice, he would have been quite satisfied that the value of clinical diagnosis, at 3 to 4 weeks after service, had been established, but he suspected that in this series he might have been influenced by something quite subjective—the knowledge that matings were being made by a dog of known fertility and at a time highly favourable to conception—and his later results had tended to strengthen this suspicion.

In conclusion, Mr. Hancock stated that he had given more concentrated attention with less success, to this particular problem, than to anything else encountered in the field. While maintaining that his tactile ability was t least average, he indicated that personally he would always withhold a positive diagnosis until the sixth or seventh week, as he felt that the palpable outlines of the pseudopregnant uterus were to him, sufficiently irregular definitely to be mistaken for the local swellings quoted as indicative of the presence of foetal sacs.

Dr. I. W. Rowlands, who also replied, said that he had found the meeting most stimulating. He wished first to deal with one or two points raised by Prof. Amoroso. Detailed records of neo-natal death had been kept, but had not yet been analysed for mortality in relation to sex. Another interesting point was the correlation between the number of corpora lutea and litter size. He wondered really whether there should be a very close correlation because of the high incidence of polyovular follicles in the ovaries of the bitch which he had noted recently. If these follicles grew to maturity and each discharged more than one fertilisable egg, it was conceivable that the number of young born would exceed the number of corpora lutea.

Then there was the question of the very extensive bleeding offering a barrier to the sperm. He had noted in discussing the protocols that during oestrus the number of red cells was very greatly reduced compared with the number found during pro-oestrus and met-oestrus. The passage of sperms through the tract was probably facilitated by this reduction of bleeding during oestrus.

Concerning the delayed onset of oestrum which Mr. Williams had pointed out, he did not know whether Mr. Williams was aware of a very authoritative paper by Pearson on the breeding of dogs. This author had a colony of pekingese and pomeranians, and was particularly interested in hybridisation. He (the present speaker) was very much relieved when he read this paper to find he was not alone in encountering delayed onset of oestrum in maiden bitches, for Pearson mentioned bitches which were 3½ or even 4½ years old before the onset of first season. Under colony conditions, which must be very abnormal for the species, the delayed onset of oestrum would seem to be a fairly regular thing. It appeared likely that the phenomenon was inherent in the method of breeding rather than associating it with some factor prevailing in the colony at Frant.

[1] Scorgie, N. J. (1939.) *Vet. Rec.* **51.** 265.

VITAMIN D IN OIL FOR POULTRY FEEDING PURPOSES

New British Standard

A new British standard, B.S. 1581: 1949, for vitamin D in oil for poultry feeding purposes has just been issued by the British Standards Institution.

For the best part of a quarter-century it has been the practice in the poultry industry to enrich mashes with some source of vitamin D. Cod-liver oil and other more potent fish-liver oils have naturally played an important part in this enrichment, but the acute shortage of these oils during the 1939-45 war made it necessary for alternative products to be available, if it were to be possible to supply the needs even of considerably reduced poultry stocks. One factor that eased the position was the increasing industrial output of vitamin D_3 concentrates made by the irradiation of recrystallised 7-dehydrocholesterol. In the second place, the world shortage of vitamin A had caused the poultry rearers in North America increasingly to favour the use of oil solutions of vitamin D_3 alone instead of fish-liver oils, on the grounds that flocks had access to other sources of pro-vitamin and vitamin A in adequate amounts.

When, therefore, it became necessary to consider revision of the British Standards for "Controlled Cod-liver Oil Mixture for Animal Feeding Purposes" (B.S. 910: 1940) and for "Vitamins A and D in Oil for Animal Feeding Purposes" (B.S. 909: 1940), two war-time specifications, the committee concerned felt bound to take into consideration the increasing oversea use of vitamin D_3 in oil as a supplement to mashes supplying vitamin A in the form of the vegetable pro-vitamin.

The committee were aware that interest in vitamin D_3 solutions was increasing in this country and would undoubtedly lead to the marketing, in part direct to the public, but mainly to the manufacturers of poultry foods, of a variety of products not only made up with various diluent oils, but containing amounts of vitamin D that might well be different for every manufacturer. The opportunity to secure some measure of standardisation before the event seemed to be one that the committee should not lose, and careful consideration was, therefore, given to the drawing up of a specification for a solution or solutions of vitamin D_3 suitable for incorporation in poultry food. It is clear that, from the point of view of conserving diluent vegetable or fish oils, the potency of such a solution should be as high as is compatible with efficient mixing. This itself will depend upon the plant available and the skill of the blender. Following what is, in the committee's opinion, a sound precedent, it has, therefore, been decided to prepare standards for two different solutions, of which the more concentrated will undoubtedly commend itself to the large manufacturer with highly efficient mixing machinery, while the less concentrated will probably be used by the smaller manufacturer and those who wish themselves to incorporate it in their poultry mash.

The levels at which either of these solutions will be used must depend primarily upon two considerations. First, it will have to be decided how much vitamin D_3 it is wished to supply the birds in their average daily mash intake; secondly, it will be necessary to know with what efficiency a relatively small amount of oil can be distributed uniformly throughout a dry mash.

The standard provides minimum limits for vitamin potency and maximum acidity, as well as methods of test.

Copies can be obtained from the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1. Price 2s. post free.

THE CONTROL OF STREPTOCOCCUS AGALACTIAE INFECTION IN HERDS BY MEANS OF THERAPEUTIC TREATMENT

By

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and

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A previous paper (Edwards, Hughes and Taylor, 1948) on the control of *Str. agalactiae* infection in a herd showed that by the application of therapeutic treatment, consisting of sulphanilamide emulsion infused into the udder of infected cows, infection could be eliminated only for a short period. Failure to eradicate infection in this herd was due in part to the poor hygienic precautions adopted at the time of milking, and it was concluded that to achieve success hand stripping should be avoided. Further, it was found that it was difficult to eliminate *Str. agalactiae* from cows affected with lesions of the teat surface. The part played by teat lesions in maintaining infection has been studied by one of us (J. I. T.) and will be reported separately.

In the work now presented a further attempt was made to eliminate *Str. agalactiae* infection in a herd maintained under improved conditions, and the results are described in Part I. The experiment was later extended to include five further herds (Part II).

PART I.

History of Herd A.—This herd of 70 to 80 Ayrshire milking cows has been regularly tested for the presence of *Str. agalactiae* since 1939. It is machine milked, but since October, 1943, no hand stripping has been practised. It is milked by the bucket type of unit and each cluster is disinfected by a four-minute immersion in two changes of hypochlorite solution containing 400 p.p.m. available chlorine, followed by a rinse in water. The cows' flanks are washed and dried prior to milking, but the udder is washed separately and a sterile cloth is used for each cow and discarded after use. Cloths are sterilised by steaming previous to use and moistened by adding freshly boiled water to the bucket in which they are contained. An additional precaution to prevent spread of infection at the time of therapeutic treatment consisted in the application of a 30 per cent. sulphanilamide emulsion by milkers to their hands daily before milking.

Methods.—Sampling and milk testing were carried out by the methods described fully in the *Bulletin Imperial Bureau of Animal Health* (1944) No. 2. Milk and teat swab samples were examined for a considerable period prior to treatment by the enriched method. Before treatment in 1947, the milks of all cows were tested by the direct as well as the enriched methods and both methods were employed in all subsequent tests which were carried out at close intervals.

Infection prior to treatment.—The milk infection rate was constant at about 15 per cent., while the infection rate for teat swabs was slightly lower (Fig. 1). At a test immediately before treatment, however, on February 24th, 43 cows out of 70 (61 per cent.) were shown to be infected by the direct and 54 (77 per cent.) by the enriched test. Of the 54 infected cows, 22 showed clinical evidence of mastitis and 34 were affected with sores of the teats. This sudden rise in infection coincided with the severely cold February of 1947 at which time, too, there was a marked rise in the incidence of cows affected with teat lesions.

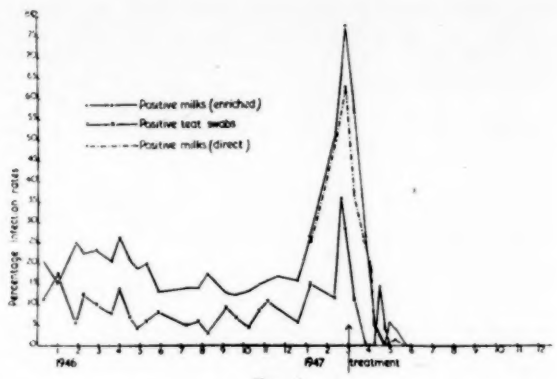

FIG. 1

Treatment of *Str. agalactiae* Infection in Herd A

Application of Therapy.—All quarters of all infected cows were treated on four successive days with 50 ml. of a 30 per cent. sulphanilamide emulsion suspended in an oil-water base (Edwards & Brownlee, 1946). The emulsion was delivered from a specially made collapsible tube fitted with a syphon for insertion into the teat orifice. Dry cows were isolated from the herd until calving when their milk was examined and treatment was administered to those found to be infected.

RESULTS

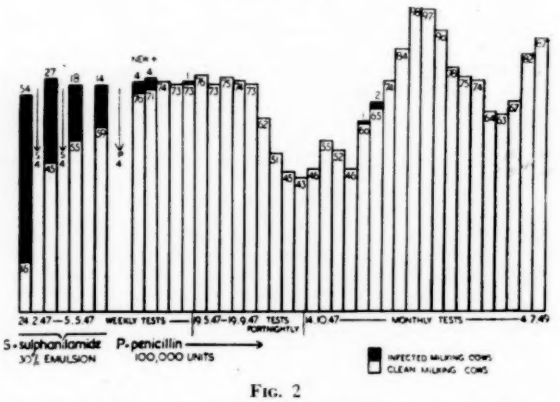

FIG. 2

Therapy with Sulphanilamide and Penicillin in the Control of Mastitis in Herd A

The results are shown in Fig. 2 which represents the number of infected and clean cows at successive tests on milk samples. Of the 54 cows originally infected, 33 (61 per cent.) responded to one course of sulphanilamide. The remaining 21 cows and six fresh infections received two weeks later, a further course, consisting of a minimum of four injections but with an extension to eight injections if samples taken daily showed that infection still persisted. In 18 of these, infection was eliminated while nine proved completely resistant. Thus sulphanilamide therapy was successful in 51 (85 per cent.) of 60 infected cows, a result which agrees closely with that obtained in our previous work (Edwards & Brownlee, 1946; Edwards, Hughes & Taylor, 1948).

In view of the failure of sulphanilamide to eradicate infection, it was decided to use penicillin in the fourth week on the nine cows which had resisted treatment and on a

further five newly infected cows which had received no treatment. These 14 cows, therefore, received four daily injections in each quarter of 100,000 units of penicillin contained in 10 ml. distilled water. Twelve of these 14 cows were freed from infection by one course of injections, while two required a further course. Eight new infections at the next two herd tests were also successfully treated. It will be seen from Fig. 2 that the herd remained free from *Str. agalactiae* infection from April, 1947 to February, 1948 when three fresh infections were found. With the exception of these three cases the herd has been free from infection for over two years.

Occurrence of Infections and Mastitis due to Organisms other than *Str. agalactiae*

Milk samples have been examined for the presence of haemolytic staphylococci on nine occasions with the following results:

Date	3.5.48	7.6.48	6.7.48	7.8.48	24.8.48
Cows tested	98	97	90	78	75
No. infected	50	47	33	33	36
Percentage	51	48	36	42	48

Date	12.1.49	16.3.49	5.5.49	4.7.49
Cows tested	63	70	83	87
No. infected	36	33	40	50
Percentage	57	47	48	57

It will be seen that the infection rate due to staphylococci in this herd is higher than that usually quoted by other workers. For instance, Bean, Miller and Heishman (1943) found 22 per cent. of cows infected in six herds, McDiarmid (1947) up to 25 per cent. in one herd and Hughes (1949) 20 per cent. in 19 herds. As the staphylococcal infection rate in Herd A before treatment is not known it is not possible to state whether an increase took place following freedom from *Str. agalactiae* as has been suggested by other workers. It is possible, however, to substantiate the findings of Cunningham, Wilson, Ineson, Raymont and Mannan (1947) who found that clinical infections of the udder due to staphylococci do not increase once *Str. agalactiae* has been eradicated from the herd, since in Herd A only three cases have occurred annually.

Infection due to other organisms has been very low since only one case of clinical mastitis due to *Coryn. pyogenes* and one case due to *Str. dysgalactiae* have occurred. Nine other cows have shown *Str. dysgalactiae* in their milk on a single occasion but *Str. uberis* has not been recovered from the herd. Contrary to the findings of Schalm (1942) and Murphy (1948), we have therefore not observed an increase in streptococcal infections due to *Str. dysgalactiae* or *Str. uberis* following freedom from *Str. agalactiae*.

PART II

Extension of Experiment to include Five Further Herds

In view of the success evident in Herd A, it was decided to try to control *St. agalactiae* infection by penicillin therapy in a small number of herds maintained under varying systems of management. Difficulty was experienced in obtaining herds which were infected with *Str. agalactiae* and the following summary shows the extent of infection in 14 herds examined.

No. of herds	Total milk-cows	No. of herds infected with *Str. agalactiae*	No. of animals infected
14	431	7	74 (17%)

The total incidence of infection due to *Str. agalactiae* in these herds was lower than that found by previous workers —Ferguson (1938) 21 per cent.; *Bull. Imp. Bur. Anim. Health* (1944) 38 per cent.; Plastridge and Hale (1948) 35 per cent. This survey, however, agrees with the recent findings of Hughes (1949) who found that 15 per cent. of cows in 19 herds were infected. Seven of the herds were free from infection while the remaining seven contained a varying degree of infection ranging from 4·5 per cent. to 43 per cent. Five of these herds were selected for treatment.

Treatment

Infected cows as well as dry cows were treated in all quarters with four daily injections of 40,000 units of penicillin in a 4·5 per cent. beeswax-oil base. New infections found at subsequent tests were also treated in the same way.

In order to control the efficiency of penicillin treatment in the original infected cows, only half were treated at first while the other half were left untreated as controls. The latter were subsequently treated in the fourth week.

Table I

The Efficiency of Four Daily Injections of Penicillin (40,000 units) in a Wax-oil Base in Eliminating *Str. agalactiae* Infection

	1st week	2nd week		3rd week			4th week	5th week
Herd	Cows infected at 3 daily tests	Cows treated	Cows untreated (Controls)	Cows infected at 3 daily tests		Controls treated		Cows infected at 3 daily tests
				Treated	Controls			
D	7	4	3	0	3	3		0 0
O	2	2	—	0	—	—		0
OH	25	13	12	2	12	12		2 0
B	14	8	6	0	6	6		0 1
P	7	4	3	0	3	3		0 0
Total	55	31	24	2	24	24		3 (5%)

Results

1. *The efficiency of penicillin in sterilising Str. agalactiae infection in infected cows*

Table I shows that of 55 infected cows, 31 were treated while 24 served as controls. Infection was eliminated from 29 of 31 treated cows while all the 24 untreated cows of the control group remained infected. Treatment of the control group of 24 cows in the fourth week removed infection in all but one cow. These results, when assessed by eight

tests conducted subsequent to treatment, showed that penicillin was effective in 52 (95 per cent.) of the 55 original infected cows.

The failures to treatment occurred in three cows belonging to two herds (OH and B). These cows were retreated with the same dose of penicillin in the sixth week with the result that one was freed from infection, but the other two remained infected in spite of repeated treatment. No abnormality of the udder or milk could be found in one of these cows, nor was there evidence that the infecting strain of *Str. agalactiae* had developed an increased tolerance to penicillin *in vitro*. The second cow, on the other hand, showed a severe ulcerated condition of the teats.

2. ***The control of infection in the herds***

In Herd A which was under our immediate control, infection was quickly eradicated by a combination of sulphanilamide and penicillin treatment and with the exception of three infections the herd has remained free for over two years. Similar results were obtained in Herds D and O in which the hygienic methods employed at milking were the same and consisted essentially in the use of the machine without hand stripping and disinfection of teat clusters between each cow.

In two herds (B and OH) the cows were milked by machine and hand stripped but no proper hygienic precautions were taken to prevent spread of infection. Nevertheless infection was quickly controlled in the former, but in the latter, after a period of nine weeks during which the

TABLE II

THE INCIDENCE OF *Str. agalactiae* INFECTION IN HERDS AT TESTS FOLLOWING TREATMENT

Herd	Number of cows in herd	Number of infected cows before treatment	Post-treatment herd tests								
			7th week	8th week	9th week	13th week	17th week	21st week	34th week	69th week	84th week
D	19	7 (37%)	0	0	0	0	0	0	0	0	0
O	44	2 (4%)	0	0	0	0	0	0	0	0	0
OH	60	25 (42%)	1	0	0	3	8	13		discontinued	
B	35	14 (40%)	1	1	1	1	1	1	0	0	0
P	38	7 (18%)	0	2	0	0	4	12		discontinued	

The herds were under supervision for 20 months and herd tests were conducted at the intervals shown in Table II, which also shows the incidence of infection subsequent to treatment.

In two of the herds (D and O) infection was eradicated, while in the third herd (B) infection was reduced to a single infected cow referred to previously which resisted repeated treatments with penicillin and was, therefore, eliminated from the herd. In Herd OH, the incidence of infection was low until the 17th week. Testing was discontinued after the 21st week when 13 cows (21 per cent.) were infected ; seven of these cows were harbouring *Str. agalactiae* at the beginning of the experiment and following treatment had been free from infection for at least seven tests. It was found on clinical examination that five of these were showing teat sores. In Herd P, the seven originally infected cows showed the presence of Group-B haemolytic streptococci and all responded to treatment. All new infections, however, were due to non-haemolytic Group-B streptococci which continued to appear in spite of treatment and testing was therefore discontinued after the seventh herd test.

SUMMARY AND CONCLUSIONS

The experience gained in the control of *Str. agalactiae* infection by segregation alone has shown that in certain herds success may be achieved (Minett, Stableforth and Edwards, 1933) but that the rate of progress in eliminating infection is generally slow, especially in herds with a high incidence (Stableforth, Edwards & Minett, 1935 ; Plastridge, Anderson, Weirether & Johnson, 1936 ; Cunningham *et al.* (1947)).

Since the effectiveness of therapeutic substances such as sulphanilamide or penicillin in the treatment of mastitis due to *Str. agalactiae* is now well established we have attempted to explore their use in the control of herd infection by the treatment of infected cows.

incidence was reduced from 42 per cent. to 5 per cent., it rose quickly thereafter. The only difference that seemed to be accountable for the different results in these two herds was that, whereas the cows in Herd B were not affected with sores of the teats, a large number of those in Herd OH showed these lesions. Furthermore, when infection became disseminated again in this herd, it was first found in cows which had been infected before treatment.

It must be concluded, therefore, that in a herd such as OH where no precautions to check spread of infection are adopted, treatment of infected cows may reduce the incidence for a short period, but it rises again especially when the susceptibility of the cows to infection is apparently increased by the occurrence of teat lesions. These results amplify those obtained previously in a herd similarly affected with extensive teat lesions where, by sulphanilamide therapy, infection could be reduced for a short period only (Edwards, Hughes & Taylor, 1948). The susceptibility of cows with teat injuries has also been observed by Bendixen (1935) and Ferguson (1944).

Though the number of cows which resist penicillin therapy is less than those resisting treatment with sulphanilamide, it must be recognised that such cases do exist though the explanation for their resistance is not to be found in an increased tolerance of the infecting organism to penicillin. Two clearly refractory cases among 55 cows treated with four daily injections of 40,000 units of penicillin were encountered and in one of these co-existent teat lesions were found, whereas no abnormality was found in the other. Since such cows constitute a serious focus of re-infection, it is to be recommended that failures to tests conducted at ten days and three weeks following treatment with penicillin should either be disposed of or strictly isolated.

In one herd (P), the original infection was due to Group-B haemolytic streptococci which was eliminated by therapy. During the course of the experiment, however,

what is believed to be a new infection with non-haemolytic Group-B streptococci was introduced and proved difficult to control. The occurrence of non-haemolytic Group-B streptococci is rare according to our experience in this area, and confined to herds which are entirely hand milked.

Acknowledgment.—Our grateful thanks are extended to Mr. J. C. Meikle, M.R.C.V.S., for sampling two of the herds, and to Dr. W. S. Gordon for his help and encouragement.

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"EFFICIENT USE OF FERTILISERS"

As an aid to agricultural leaders responsible for fertiliser use policies and to advisers working with farmers and farm groups all over the world, the Food and Agriculture Organisation of the United Nations has published "Efficient Use of Fertilisers," a 183-page publication which brings together for the first time, in brief form, for use by member countries, world experience in the use of animal manures, fertilisers, and "soil amendments," such as lime, to increase crop production.

The publication is a practical example of co-operation extending across national borders such as is fostered by F.A.O.: 32 specialists from 14 countries had a part in its preparation. Fertiliser practices in 30 countries are referred to in the text. The book is edited by Dr. Vladimir Ignatieff, soil fertility specialist with F.A.O.'s Agriculture Division.

Emphasis is on *efficient* use of fertilisers, used as part of a farming plan which also takes into account soil analysis, crop rotation, erosion control, irrigation, drainage, liming, and other practices which must be part of a balanced farm operation. Without this balance money spent on fertilisers may be wasted.

During World War II and since, the publication points out, demand for fertiliser has exceeded supply, in spite of an overall increase of one-third in chemical fertiliser production, as compared with pre-war. Nearly everywhere that people are trying to increase agricultural efficiency and raise larger crops to feed expanding populations, more fertilisers are needed.

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UNIVERSITY OF CAMBRIDGE

In a Congregation on October 15th the degree of M.A. was conferred on Frank George Young, D.SC., F.R.S., Sir William Dunn Professor of Biochemistry in the University. Professor Young has been appointed a member of the Council of the School of Veterinary Medicine until December 31st, 1950, in place of Dr. Chibnall, who has resigned.

The Raymond Horton-Smith Prize for 1948-49 has been awarded to John Rupert Squire, M.D., for his essay on "The Relationship Between Horse Dandruff and Horse Serum Antigens in Asthma." *Proxime accessit*: Michael Braithwaite Paul, M.D., whose subject was "Thoracoscopy and Internal Pneumolysis in the Treatment of Pulmonary Tuberculosis."

CLINICAL COMMUNICATION

A PRELIMINARY NOTE ON THE TREATMENT OF UTERINE INERTIA IN THE BITCH

E. P. BARRETT, M.R.C.V.S.

A Cocker Spaniel bitch was presented for examination at the 63rd day of gestation. She was showing the usual signs of restlessness, making a bed, and panting intermittently. Digital exploration *per vaginam* found a puppy presented. The bitch was making no attempts at expulsion of the puppy. Pituitrin 1 c.c. was injected intramuscularly, but without result. Half an hour later, an injection of 10 c.c. of a 20 per cent. solution of calcium borogluconate was given intravenously. Immediately following this, the bitch, as is usual, made attempts at vomiting and defaecation, and during these a live puppy was expelled. No further treatment was given, and six puppies were delivered at short intervals.

A Dachshund bitch was presented for examination at full time, showing the normal preparations for parturition as the above-mentioned bitch, and with a puppy presented, but making no attempts to strain.

The first puppy was removed with forceps in a moribund condition. Following this, 1 c.c. of pituitrin was injected intramuscularly, and shortly afterwards another puppy was born. Further injections of pituitrin provoked no response, and Caesarean section was being dicussed. It was then decided to give an intravenous injection of 5 c.c. of a 20 per cent. solution of calcium borogluconate. Within two minutes of the injection, the same attempts at vomiting and defaecation occurred, and a puppy was expelled. The remaining three pups were born without further interference.

Discussion

It appears that both these bitches were suffering from uterine atony, possibly associated with hypocalcaemia. At all events, both responded spectacularly to the exhibition of calcium. Both would otherwise have been treated surgically, with much greater risk to both bitch and puppies.

ABSTRACTS

[Morphology of Bovine Spermatozoa. Rao, C. K., & Hart, G. H. (1948.) *Amer. J. vet. Res.* **9.** 117.]

A large part of this article deals with the technique of taking and preparing specimens of semen for staining and further examination. The functional activities of the different parts of the normal sperm are described also, but throughout this article the stress is upon the abnormal sperms and the variations which occur, as a direct result of variations in technique. These may occur as a result of temperature changes, or manipulations associated with the making of the microscopical preparations, changes in the tonicity of the solution, etc.

The development of the sperm from the primordial sex cells is discussed and various anatomical features are considered in detail. Special reference is made to the protoplasmic droplets. Each sperm carries one of these, but it loses it in the lower tract as soon as motility is initiated by

the stimulating and diluting influence of the accessory secretions. To indicate the great importance of standardisation of technique the author gives a table showing the number of droplets in 100 sperms from three different bulls before and after dilution. The increased activity brought about by dilution resulted in a great reduction in the number of droplets.

The author quotes Laglof as stating that the number of pathological sperm in a bull with good fertility should not exceed 17 or 18 per cent. As regards motility, he quotes another author as stating that 70 per cent. motility is a permissible minimum for semen used in artificial insemination.

N. S. B.

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[The Status of Sodium Fluoride Treatment for the Removal of Large Roundworms from Swine. FOSTER, A. O., ENZIE, F. D. HABERMANN, R. T., & ALLEN, R. W. (1948.) *Amer. J. vet. Res.* **9.** 379-385.]

This article provides a very useful résumé of all published information on the treatment of pigs with sodium fluoride as an anthelmintic and includes a valuable list of references. The efficiency and safety of the drug when used at the therapeutic dose and in the correct manner are emphasised. Therapeutic trials carried out by seven groups of investigators on a total of 308 pigs, showed an efficiency of 95 per cent. against ascarids, and of 93 per cent. against the stomach worms *Ascarops* and *Physocephalus* when 43 pigs were involved. The anthelmintic was relatively ineffective against nodular worms, whipworms, and thorn-headed worms. The currently recommended dosage rate, 1 per cent. commercial sodium fluoride in dry, ground feeds for one day, gave an efficiency of 93 per cent. against ascarids and 62 per cent. against stomach worms. In a comparison with oil of chenopodium and phenothiazine, it is noted that the former removed 182 (74 per cent.) of 245 ascarids from 59 pigs, and that the latter removed 736 (36 per cent.) of 2,022 ascarids from 83 test pigs. Sodium fluoride additionally has the power of removing immature as well as mature roundworms. Toxic reactions following the use of sodium fluoride were infrequent, the most common being vomition, and soft faeces. These occurred in about 10 per cent. of the cases, and were only of short duration. Concentrations of 4 per cent. and 5 per cent. of fluoride in the feed were very toxic, but lower concentrations up to 1 gm. per lb. of bodyweight or about ten times the therapeutic level, did not produce very serious reactions. Experimentally, and in field trials, it was found that methods of administering the drug, other than in ground feed, did not have any advantages and frequently involved the risk of toxic symptoms. Methods employed were giving the drug in capsules, by stomach tube, and in swill. Vomition almost invariably followed any of these methods. The drug appears to have a self-limiting effect on pigs, as overdoses invariably cause vomiting, and therefore the discharge and dilution of the drug. The authors recommend that further work be carried out to determine the optimum dose, but experience so far has shown that sodium fluoride administered in dry, ground feed at a level of 1 per cent. for one day, is a safe, effective and simple method of treatment.

G. C. B.

WEEKLY WISDOM

There must be a fair balance of public interest and private right.
—Lord Justice Denning.

QUESTIONS AND ANSWERS

The submission of questions for inclusion in this column will be welcomed; they can relate to any aspect of veterinary work. For purposes of record, each question is numbered, and those submitting questions are required to furnish (not for publication) name and address.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

Prevention of Foul-of-the-foot in a Dairy Herd

Q. 330.—*How may foul-of-the-foot be prevented in a dairy herd in which this disease is particularly prevalent?*

A.—The treatment of foul-of-the-foot in the dairy herd in which the disease is markedly prevalent is, in the respondent's view, dependent upon providing conditions which will avoid those small injuries to the cleft of the foot which appear to be associated with the entry of infection and subsequent development of clinical lesions.

The importance of proper attention to approaches to fields, etc., and the avoidance of sharp grit, granite chips, sharp stones, etc., is obvious. Chalk is a very good filling for such a purpose. With cows lying-in overnight the feet often become dung coated and where cattle have to travel across roads, etc., particularly in wet weather, there is a tendency for small stones to become adherent to the coated feet. It is advantageous for the feet of such animals to be washed prior to leaving the shed, to prevent stones becoming adherent, subsequently penetrating and causing injury.

In herds in which the disease has been prevalent, and in which this method has been adopted, there has been a considerable reduction in the number of clinical cases of foul-of-the-foot.

* * * * *

Canine Anaesthesia "on the Spot"

Q. 331.—*Frequently I am called to a dog which has sustained cuts or injuries, or both. I need a quickly acting general anaesthetic which can be given by hypodermic injection, and be effective for about 20 minutes. I am single handed, the dog might be very difficult for one person to handle, and I am not versed in intravenous injection technique.*

A. (1).—It is not possible to suggest any anaesthetic agent which will fulfil all the requirements of the questioner. The agent which most nearly meets his requirements, and one which is strongly advocated by the respondent in the circumstances described, is thiopentone soluble (penthothal, intraval, etc.). The use of this anaesthetic necessitates proficient intravenous technique, but this is not difficult to acquire; thiopentone is too irritant to be injected by any other than the intravenous route.

Duration of anaesthesia can be varied at will by the rate of administration and dosage (see Wright's Veterinary Anaesthesia, p. 188) between limits of about three to 25 minutes; the recovery period is short.

Whilst it is obviously desirable to have an assistant available (a co-operative owner can well give the required assistance) pentothal may easily be administered intravenously by a single-handed technique, using the radial vein. The writer considers this to be practicable in upwards of 90 per cent. of dogs. Narcotic excitement during induction with pentothal is uncommon and this obstacle will be encountered only infrequently.

It is not proposed to outline the single-handed intravenous technique unless specifically requested since it is largely a matter of common sense. The vein can be raised sufficiently by applying a light tourniquet above the elbow, and this is not sufficient to prevent the flow of blood and

the injection of the anaesthetic agent without loosening the tourniquet. In the case of a really fractious dog pre-narcosis with a small dose of morphine will allow the intravenous administration of pentothal in almost every case.

(2).—To attain narcosis, one may inject morphine subcutaneously in a dose varying from ¼ to about 2 grs. according to the weight of the animal, and variations in age and condition. For instance, the very young and the very old have greater susceptibility. Morphine is best given along with atropine sulph. (dose 1/250 to 1/30 gr.) in order that salivation and cardiac depression may to some extent be controlled. When hyoscine hydrobrom. is added to morphine, many dogs receiving the compound become fully anaesthetised ; but, of course, all individuals do not react in the same way. (Dose of hyoscine 1/200 gr. per 20 lb.)

If the enquirer does not object to a prolonged narcosis, then general anaesthesia (lasting about an hour) may easily be induced by intraperitoneal injection of nembutal (1/5 gr. per 1 lb. bodyweight) or narcosis by I/P injection of 1/10 gr. per lb. weight. This method can be performed single handed provided the animal is under restraint on an operating table.

Reference.—Hamilton Kirk's " Index of Treatment," p. 149.

Scrutineer's comment.—The answer to this question is that there is no hypodermic injection, other than an intravenous one, which will produce anaesthesia for about 20 minutes. Pentothal sodium given intravenously, preceded or not by pre-narcosis with morphine, is, of course, ideal for the purpose. The questioner should be pressed very strongly, to master the intravenous technique, which is perfectly simple in the average dog with the assistance of the average owner, excluding the hysterical ones.

The only other suggestion I would make is the hypodermic injection of local anaesthetic around the affected area, or for nerve block where this is practicable. Pre-narcosis with morphine could be used in the difficult patient.

Intra-peritoneal injection of nembutal, as suggested by your second respondent, presents no difficulty if assisted by a sensible layman, but results, of course, in prolonged anaesthesia and considerably delayed return to normality.

. . . . . .

Sterility and Abortion in Cats

Q. 332.—*What may be the cause of:*

1. *Metritis or sterility in cats (Siamese) occurring after service.*

2. *Abortion at about 50 to 60 days. What treatment would be recommended ?*

A.—Assuming that the questioner has in mind the repeated occurrence in a cattery of any or all of the conditions mentioned, the question can probably best be discussed as an entity and it is suggested that thorough investigation be made into

(1) general hygiene and the likelihood of carried infection (streptococcal ?),

(2) diet and general state of nutrition,

(3) management of mating and of the subsequent pregnancy when it occurs.

Streptococcal infection may be the cause of sterility, metritis or abortion and the two former in most cases respond well to penicillin (100,000 I.U. 12-hourly) before and after mating, at mid-term and if considered necessary, at kittening.

In cases of abortion of a live foetus or one recently dead where the cat runs a high temperature and live foetuses are known or suspected to remain, prompt injection of penicillin may allow pregnancy to proceed to term.

In cases other than those of frank general malnutrition, where dietary deficiency is suspected, the exhibition of vitamin E (or Bemax) during season and throughout pregnancy may be helpful.

In the absence of malnutrition or disease it is not uncommon for the Siamese to be infertile to selected single matings, yet produce a mongrel litter to the mating of choice with complete ease and normality, and in such cases it is advisable to allow the male to run with the female and mate freely as long as his presence is tolerated by the female.

Breeding history in the cattery should be enquired into with hereditary influences in mind and in the case of abortion, otherwise unexplained, the possibility of trauma considered.

Habitual abortion in an individual may be due to insufficiency of luteal influences. In discussing the logical use of progestin in such cases Hamilton Kirk quotes as a warning against overdose a case of a Siamese cat in which abortion was prevented but subsequent uterine inertia occurred.

Reference.—Hamilton Kirk's " Index of Treatment," p. 157.

* * * * *

Correspondence

Assessment of " Recently Calved "

Sir,—The answer to question 328 published in your issue of October 29th does not agree with observations made at this Field Station.

From examinations made on over 100 cows and heifers at intervals of one, four, eight, 15 and 21 days after calving, it is clear that involution is more rapid than is generally believed. In 16 per cent. the uterus had completely involuted in eight days and 77 per cent. required up to 15 days. In every case involution was complete in three weeks. In cases of abortion not caused by *Brucella abortus* involution was amazingly rapid. In some it was complete within five to six days and often the animal came into oestrus at the same time.

About 50 per cent. of cows develop follicles in the ovaries about three weeks after calving and most of these show signs of heat. It depends, of course, on the time of the year. During spring and summer the percentage is rather more, while in winter it is lower, and many cows will take six to nine weeks before coming on heat.

Yours faithfully,

W. J. Jordan.

The University of Liverpool School of Veterinary Science,
Field Station, " Leahurst,"
Neston, Wirral.
November 3rd, 1949.

* * * * *

Treatment of Multiple Warts

Sir,—In your issue of October 29th—treatment of multiple warts—your respondent recommends clipping off with scissors or with wire écraseur.

This method removes only part of the growth and surely must be unsatisfactory and disappointing, as it increases size and tends towards spread.

My experience is that the only satisfactory method is to free the growth from the surrounding skin with a sharp scalpel, grip it as near the base as possible with spoon forceps, and extract it. Swab the cavity and, if any white tissue (wart) is left, remove it—each growth to be treated in this way. Haemorrhage is practically nil. Afterwards, treat as a simple wound and nine times out of ten the warts do not recur.

Yours faithfully,

W. Allen Smith.

The Manse, Boyle.
October 29th, 1949.

. . . . . .

Sir,—Perhaps the most successful treatment and certainly the easiest to apply for the above troublesome complaint is a paste prepared by mixing an arsenical sheep dip powder (personally I use

Cooper's yellow arsenical preparation) with liquid paraffin to the correct consistency.

Clean off all scabs and discharge and then smear on the paste with a flat piece of wood and repeat in four or five days' time. The warts dry up and will rub off or disappear in a surprisingly short period.

This treatment is particularly useful when the warts are close to or on the eyelids or round the upper part of the lips, where it is difficult to operate.

Yours faithfully,

ARNOLD SPICER.

REPORT

[Director of Veterinary Services, Southern Rhodesia. Annual Report for 1948.]

There were several outbreaks of foot-and-mouth disease during the year. Control measures included the cordoning off of infected areas, and inoculation. In the Fort Victoria District 19,544 animals were inoculated. The position with regard to African Coast fever is stated to be very satisfactory, but epididymitis-vaginitis spread considerably during the year. In addition to quarantine measures, the latter disease is controlled by slaughter of the infected bulls and vaginal douching of the cows. In some cases the disease did not prove amenable to treatment and a number of cows became sterile.

The practice of inoculating animals against anthrax for three years in succession, in the infected areas, was continued with good results. Two outbreaks alone necessitated the inoculation of 33,000 head of cattle.

A relaxation of precautionary dipping during the winter months led to an increase of piroplasmosis and anaplasmosis. One outbreak of heartwater, with the loss of nearly 50 animals, occurred, and was controlled by movement of the cattle, dipping and hand-dressing.

Trypanosomiasis has increased along the border of Portuguese East Africa. Treatment with dimidium bromide proved very successful. Brucellosis and mastitis are the cause of considerable losses among dairy herds. Strain 19 vaccine was available only in very limited quantities, while the poor hygiene was responsible for much of the mastitis. Trichomoniasis was diagnosed in a heifer imported from England, a fact which demonstrated the value of the month's quarantine period imposed on all animals imported from overseas. Liver fluke continues to take a heavy toll, and accounted for the condemnation of 34 livers out of every 100 cattle slaughtered under veterinary supervision.

During the year 114,068 cattle were slaughtered, the figure for pigs being 32,112, and for sheep and goats, 25,287. The European cattle population was estimated to be 1,093,470 ; the native cattle population 1,754,641. There are now 3,948 dipping tanks in Southern Rhodesia. During the year 179,791 doses of blackquarter vaccine were issued, and 14,104 doses of fowl typhoid vaccine and 138,600 doses of chicken pox vaccine were used. Over 6,000 doses of Horse Sickness vaccine were supplied to the public, and over 3,000 doses of redwater and gallsickness vaccine. At the end of the year, Southern Rhodesia was short of five field veterinary officers and one research officer. G. P. W.

QUESTIONS IN PARLIAMENT

Cattle (Tuberculosis Eradication)

Mr. DYE (Nov. 10th) asked the Minister of Agriculture when his proposed scheme for the eradication of tuberculosis in cattle on an area basis will be introduced.

Mr. T. WILLIAMS: October 1st, 1950.

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FOWL PEST, SCOTLAND

Sir BASIL NEVEN-SPENCE (November 10th) asked the Minister of Agriculture which counties in Scotland have been affected by fowl pest; whether any conclusion has been reached regarding the origin of the outbreak; and what steps are being taken to deal with it.

Mr. T. WILLIAMS: Outbreaks of fowl pest on the mainland of Scotland have been confirmed in the counties of Aberdeen, Angus, Inverness, Renfrew, Ross and Cromarty and Wigtown. In addition there have been outbreaks on several islands in the Orkney, Shetland, Outer Hebrides and Inner Hebrides groups. A single outbreak has been found on the Bass Rock in the Firth of Forth. The first outbreak was discovered in the Orkney Islands, but, as the disease had existed there for about a month before it became known to my Department, it has not been possible, so far, to assign any definite cause to that outbreak. Every effort is being made to ensure early notification of any suspicious circumstances amongst poultry flocks and the usual measures of slaughter and disinfection are being taken to deal with the disease.

Sir B. NEVEN-SPENCE: Can the right hon. Gentleman say whether a ban has been placed on the movement of live or dead poultry out of any of these affected areas?

Mr. WILLIAMS: I believe that an order does exist preventing movement to markets, and so forth.

Sir B. NEVEN-SPENCE: Does that apply to all the affected areas?

Mr. SCOLLAN: Is not it the case that this fowl pest is actually being carried by wild fowl, and that in those circumstances it is impossible to stamp it out?

Mr. WILLIAMS: I can only say that my veterinary officers are doing their best to stamp out fowl pest in Scotland as well as in England and Wales.

Sir B. NEVEN-SPENCE: Can the right hon. Gentleman say whether this ban on movement has been applied to all the affected areas?

Mr. WILLIAMS: I cannot say without notice.

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AGRICULTURE AND FOOD (MINISTRIES)

Mr. DAVID RENTON (November 10th) asked the Prime Minister whether, in view of the need for economy, and in order to ensure greater co-ordination of the interests of consumers and producers, he will combine the Ministry of Agriculture and Fisheries and the Ministry of Food to form one Ministry.

The PRIME MINISTER (Mr. Attlee): No, Sir; I have nothing to add to the answer given to the hon. Member for Evesham (Mr. De la Bère) on April 12th last.

Mr. RENTON: Is the right hon. Gentleman aware that circumstances have changed slightly since April 12th last, and does he agree that a merger of these two Ministries would enable a substantial saving in administrative costs to be made as well as greatly to improve the co-ordination of the interests of consumers and producers? If he does agree on those two points will the Prime Minister say why he declines to alter his previous decision?

The PRIME MINISTER: The hon. Member is again repeating a supplementary question which has been answered on many occasions. I do not think that the interests of consumers and producers would necessarily best be served by an amalgamated Ministry. I am not so sure whether that would bring about any great economy in staff and expenses. I am not persuaded at present that there would be any advantage in doing what the hon. Member suggests.

Mr. COLLINS: Can my right hon. Friend say whether the particular case of horticulture is given any consideration on the question of whether some transfer of functions from one Ministry to another might not be usefully made?

The PRIME MINISTER: I should like to see that question on the Order Paper.

Mr. SCOLLAN: Has my right hon. Friend considered the practicability of giving fisheries a Ministry of its own as it is obviously too big a matter to be part of a Ministry dealing also with agriculture?

Mr. RENTON: Is the Prime Minister aware that the Ministry of Food is already concerned with the interests both of consumers —wholly, we hope—and producers—to a mild extent—and is he aware that there has been confusion between the functions of the

Ministry of Food when they are concerned with production and the functions of the Ministry of Agriculture? Will the right hon. Gentleman try to ensure a better co-ordination of the work of these two Ministries in that respect in future?

The Prime Minister: That was the fourth supplementary question asked last April.

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Milk Production (Cleanliness)

Mr. Skeffington-Lodge (November 10th) asked the Minister of Agriculture whether his attention has been drawn to the remarks of the chief milk advisory officer to the Lancashire Agricultural Executive Committee to the effect that carelessness and dirty habits among producers and their employees are spoiling large quantities of milk; and what steps are being taken by his Department to improve matters, especially in relation to personal hygiene.

Mr. T. Williams: Yes, Sir. The new Milk and Dairies Regulations which came into force on October 1st require certain hygienic precautions in the production and handling of milk, including the observance of personal cleanliness by producers and their employees. It is my intention to ensure that these conditions are enforced as strictly as possible.

Mr. Skeffington-Lodge: As in a greater or lesser degree almost every part of the country is affected by this very important question, will my right hon. Friend consider making representations to all county agricultural executive committees that they should get to work on it in their own particular area?

Mr. Williams: The county executive committees have already been informed of their responsibilities, and I am sure they will carry them out.

Dr. Segal: Has my right hon. Friend any evidence that carelessness and dirty habits among milk producers are more prevalent in Lancashire than in other parts of the country?

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Food Poisoning (Causes)

Mr. John Morrison (November 10th) asked the Minister of Health to what causes he attributes the recent increase in cases of food poisoning.

Mr. Bevan: No precise answer can be given. But more information is being received, analysis of which may throw further light on the causes of the increase. So far as concerns pre-war figures, I should point out that the apparent increase is probably largely due to increased information and investigation.

Mr. Morrison: Can the Minister say whether he has gone into the details of food kept in cold storage over long periods? Does he not think that that has something to do with it?

Mr. Bevan: All the inquiries that are relevant are being made. I would not alarm people unduly by assuming that there is an absolute increase.

Mr. Peter Freeman: Would my right hon. Friend consider what steps can be taken to make the facts of such food poisoning public, as they are often suppressed both in respect of the nature of the food and the reason for the poisoning not being made known, and as a result the public are not aware of the facts?

Mr. Bevan: I am entirely unaware that the facts are suppressed. Where there is a fatality, and the coroner's inquest is held, all the facts are very well known.

Mr. Skeffington-Lodge: Will my right hon. Friend agree that the standard of personal hygiene of many people in this country is still deplorably low, and that this has an important bearing on this question?

Mr. Bevan: I think that there is growing awareness of the necessity of cleanly habits in the handling of food in the shops and depots and in the homes. I am hoping that the public education which is now taking place will have the effect of raising standards.

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Horses (Export)

Mr. Dodds-Parker (November 3rd) asked the President of the Board of Trade the total number of horses exported from this country during the latest month for which figures are available; and indicate how many were sent to each of the countries concerned.

Mr. H. Wilson: The total number of horses (including ponies) exported from the United Kingdom in September, 1949, was as follows:—

Country	*Number*
Irish Republic	108
Belgium	25
France	21
Federation of Malaya	17
Mauritius	15
Singapore	6
Australia	5
Trinidad and Tobago	4
Barbados	3
Union of South Africa	3
United States of America	3
Colombia	2
Channel Islands	2
Ceylon	1
Panama	1
Jamaica	1
Germany	1
Brazil	1
Kenya	1
Falkland Islands	1
Sweden	1
Total	222

These figures include horses exported for all purposes, including those exported temporarily for racing, breeding or exhibition, and also those re-exported after temporary importation into the United Kingdom for similar purposes.

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Hen Batteries

Mr. Peter Freeman (November 3rd) asked the Minister of Agriculture whether he will arrange for an enquiry into the use and practice of hen batteries which involve considerable cruelty to the birds concerned and cause widespread diseases and inferior quality eggs, many of which are unfit for human consumption.

Mr. T. Williams: No, Sir. I would refer my hon. Friend to the answer I gave to the hon. and gallant Member for Ayr Burghs (Sir T. Moore) on June 2nd last, when I said that in the absence of any evidence of cruelty I did not propose to reduce or abolish the battery system of keeping hens. I have no evidence to support the view that, with a normal standard of management, battery birds are either more prone to disease or produce eggs of lower quality than birds kept under other conditions.

Mr. Freeman: Is my right hon. Friend aware that a report sent recently to *The Listener* states that many of these birds are kept in unnatural conditions, are unable to exercise their limbs, and are in an extremely poor state of health, and that neither they, after killing, nor the eggs they produce can be considered as fit for human consumption. Would the Minister take such letters as that into account?

Mr. Williams: I am not aware of the document which the hon. Member is reading.

Sir T. Moore: Is the right hon. Gentleman aware that since I questioned him on this subject in June, I have received many letters from poultry breeders themselves condemning this practice, although not on the lines mentioned by the questioner, that the eggs are bad—they are not—but merely on the question of cruelty? Will not the Minister make further investigation or accept the evidence I have submitted to him?

Mr. Williams: I can assure the hon. and gallant Member that this matter is constantly under examination and whenever cruelty is proved, which is not the case yet, we will look at it.

NOTES AND NEWS

Diary of Events

Nov. 23rd.—Dance of the Ayrshire Division of the Victoria Veterinary Benevolent Fund Ladies' Guild, at Western House, Ayr.

Nov. 23rd.—Annual Meeting of the Scottish Branch, N.V.M.A., at Glasgow (George Hotel, 235, Buchanan Street), 2.30 p.m.

Nov. 24th.—Meeting of the Hertfordshire and Bedfordshire Veterinary Society at Luton (The George Hotel), 2.30 p.m.

Nov. 25th.—Meeting of the Royal Counties Division, N.V.M.A., at Aylesbury (Ye Olde Bull's Head Hotel), 2.30 p.m.

Nov. 25th.—Autumn Meeting of the Eastern Counties Division, N.V.M.A., at Cambridge (Institute of Animal Pathology), 2.15 p.m.

Dec. 1st.—Meeting of the Central Veterinary Society at the Royal Veterinary College, Camden Town, 6 p.m.

Dec. 2nd.—Meeting of the South Wales Division, N.V.M.A., at Neath (Castle Hotel), 2.15 p.m.

Dec. 7th.—Meeting of the South-Eastern Division, N.V.M.A., at Maidstone (Royal Star Hotel), 2.30 p.m.

Dec. 30th.—Annual Dance, Dumfries and Galloway Branch V.V.B.F. Ladies' Guild, at Dumfries (Cairndale Hotel).

Eradication of Tuberculosis in Cattle on an Area Basis

MINISTER ANNOUNCES INTRODUCTION IN OCTOBER

Mr. Williams' announcement in the House of Commons on Thursday of last week that the scheme for the eradication of tuberculosis in cattle on an area basis will be introduced on October 1st, 1950, will be welcomed by all concerned. The terms in which the Minister previously had intimated its postponement were such as to arouse apprehension that, in the event, the introduction of the scheme, owing to the economic situation of the country, might be delayed seriously. Under these circumstances, the intimation now made will be received with relief and satisfaction.

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The Swedish Veterinary Congress, 1949

The President and Senior Vice-President represented the N.V.M.A. at the Annual Congress of the Swedish Veterinary Association held in Stockholm on October 28th, 29th and 30th, and were accompanied by Mrs. Brutord and Mrs. Montgomerie. They were welcomed at the airport by the Swedish Association's Secretary, Dr. Krantz, and stayed at the Grand Hotel, Stockholm, as the guests of the Swedish Association. This kind and generous gesture was the prelude to five days of quite remarkable hospitality.

On the morning of October 28th the President of the Swedish Association, Col. F. Wilhelmson, accorded a warm welcome to the N.V.M.A. delegates and the delegates from Norway and Denmark. This welcome was followed by an excellent address in English by Professor Carlstrom on "The Deficiency Diseases, especially in Horses and Dogs." Professor Eriksson, Dean of the Royal Veterinary College, then gave a delightful summary of the history and work of the College before personally conducting the party on a tour of inspection of the large and well-equipped buildings and hospital. The new department of obstetrics and surgery, under the direction of Professor Lagerlof, with its ingenious teaching apparatus, collection of identical bull twins and work and study on infertility problems, were typical of the enthusiasm and vitality of its Director.

A visit to the magnificent State Serum Institute and Research Station under the direction of Professor Hjarre, was no less impressive. The buildings and equipment are the result of three years of careful thought and planning and the Institute is indeed a place of which the profession in Sweden may be justly proud. It forms the background to a veterinary service of the highest order.

At the Animal Breeding Centre Dr. Hanson demonstrated the work based on the use of identical twins, 48 pairs being maintained for research. The tour of inspection was highly instructive and greatly appreciated.

The Secretary, Dr. Krantz, was always at hand to see that arrangements ran smoothly and that the guests did not miss any of the many points of interest and beautiful buildings in this city of bridges which is the capital of Sweden.

The Swedish Association gave a dinner at the Grand Hotel in honour of the overseas delegates who were privileged also to attend the Congress Dinner, at which the greetings and good wishes of the N.V.M.A. were conveyed to the Swedish Society. Apart from these delightful official functions the British delegates were entertained in the homes of the President, the Dean of the College, Professor Hjarre, Professor Lagerlof and Dr. Krantz at a level of hospitality now unknown in Great Britain.

While the visit was a memorable one for our representatives, it has a deeper significance in cementing the friendship of the profession in the two countries and, perhaps, in preparing the way for the XVth International Veterinary Congress, to be held in Stockholm in 1953. Already the profession in Sweden is laying its plans for an occasion, the success of which is assured by enthusiasm and facilities second to none. We know that a very warm welcome awaits the overseas visitors to that Congress and that the contingent from Britain who will surely make the journey to this Northern capital can depend on a most profitable and enjoyable visit.

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PERSONAL

Births.—DAVIES.—On October 24th, 1949, at The Gables Nursing Home, Dorchester, to Joan (Peggy), wife of H. Stanley Davies, M.R.C.V.S., a sister for Andrew.

HIRST.—On November 9th, 1949, at Poltimore House Nursing Home, Exeter, to Audrey, wife of Basil Hirst, M.R.C.V.S., Ailsa Cottage, Woodbury, Exeter, a son—Martin Beverley.

R.C.V.S. OBITUARY

TALBOTT, Henry Crichley, 35, Richmond Grove, Surbiton, Surrey. Graduated London, March 31st, 1880. Died November 2nd, 1949; aged 89 years.

MR. HARRY C. TALBOTT, M.R.C.V.S.

Mr. H. C. Talbott, whose death at the great age of 89 years we record above with much regret, practised at Surbiton Hill for more than 45 years.

Mr. Talbott came from his native Lincolnshire to the London area after he qualified as an M.R.C.V.S. about 60 years ago. He was thoroughly devoted to his practice, only retiring from active work a few months ago, and had been particularly interested in racing pigeons and pigeon flying generally.

Mrs. Talbott died in 1933 and he is survived by a son and a daughter.

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R.C.V.S. Animal Management Examination

LIST OF SUCCESSFUL CANDIDATES

(*Continued from page 767*)

GLASGOW:

Armour, James.	Ommer, F. G.
Brown, P. R. F.	Taylor, John L.
Jackson, W. G.	Watson, J. G.
McLachlan, Iain.	Watson, R. C.

EDINBURGH:

Dawson, R. T.	Fraser, J. S.

DUBLIN:

Butler, G. M.	McDermott, Patrick
Carolan, E. S. E.	McGinley, M. D.
Dempsey, F. P.	Moscow, J. R.
Lucey, D.	O'Driscoll, J. G.

Pharmacology, Etc., Examination

DUBLIN:

Casey, P. J. P.	O'Riordan, Miss M.
Johnson, D. P.	O'Rourke, W. J.
McGlinchey, D. E.	Roche, L.
Nelson, W. F.	Rogers, E. P. S.
O'Connor, Michael.	Scully, M. A.
O'Connor, P. J. M.	Tyrrell, K. M.

LONDON:

Ball, Miss J. B.	Hawksley, M. B.
Barker, G. L.	Hoddinott, R. P. F.
Catterall, P. W.	McMillan, D. D.
Christie, E. J.	Marston, J. R. T. (Credit)
Cook, T. F.	Neal, N. W.
Davies, D. R. (Credit).	Newbery, M. J. E.
Davies, W. E. O.	Peacock, Ralph
Davy, Miss J. D.	Perrin, Miss P. E. V.
Downie, N. F.	Sparrow, W. B.
Edwards, T. W.	Traynor, D. K. (Credit).
Evans, A. D. G.	Wallace, H. G.
George, J. K.	White, Miss K. S. (Credit).
Gilmore, J. D.	Williams, W. D. (Credit).

LIVERPOOL:

Boyt, W. P.	Jones, E. H. (Credit)
Clarke, P. B.	Jones, K. W. R.
Dawkins, H. P.	Keay, A. J.
Edwards, D. K.	Kenworthy, Raymond
Evans, A. N. (Credit)	Leach, S.
Fairhead, A. C. W.	Lewis, J. O.
Gunner, D. E.	Lucas, J. M. S.
Hudson, J. H.	Pryce, R. L.
Hughes, P. A.	Randle, P. O. (Credit)
Hysloo, N. St. G.	Roddis, A. F.
James, R. H.	Unsworth, W. P.
Johnson, R. H.	Woods, A. J.

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Erratum.—In a communication on the Treatment with Vitamin B, of Bracken Staggers in the Bovine (*The Veterinary Record*. 61. 768) the words "August 28th and 29th" should read "August 27th and 28th" (line 10).

ROYAL SOCIETY AWARDS

The Royal Society announces that the King has approved recommendat ons made by the Council of the Society for the award of the two Royal Medals for the current year to the following:—

Sir George Thomson, F.R.S., for his distinguished contributions to many branches of atomic physics, and especially for his work in establishing the wave properties of the electron;

Professor R. A. Peters, F.R.S., for his distinguished bio-chemical researches, in particular his investigations of the bio-chemical role of vitamin B_1 in tissue metabolism and of the mechanism of the toxic action of lewisite and other arsenic compounds.

The following awards of medals have been made by the President and Council of the Society:—

Copley Medal.—Professor G. C. de Hevesy, FOR.MEM.R.S., for his distingu shed work on the chemistry of radio-active elements and especially for his development of the radio-active tracer technique in the investigation of biological processes.

Davy Medal.—Professor A. R. Todd, F.R.S., for his structural and synthetic studies and achievements in organic and biochemistry, with spec al reference to vitamins B_1 and E and the naturally occurring nucleos.des.

Sylvester Medal.—Professor L. J. Mordell, F.R.S., for his distinguished researches in pure mathematics, especially for discoveries in the theory of numbers.

Hughes Medal.—Professor C. F. Powell, F.R.S., for his distinguished work on the photography of particle tracks and in connection with the discovery of mesons and their transformation.

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SCOTT ROBERTSON MEMORIAL FUND

Ulster Commentary recalls that this month marks the silver jubilee of the Faculty of Agriculture at Queen's University, Belfast, and cont nues: "The occasion is to be marked by the inauguration of a George Scott Robertson Memorial Fund to perpetuate the memory of the Faculty's first Dean and Professor of Agricultural Chemistry. In the later years of his life Dr. Scott Robertson was Permanent Secretary to the Ulster Ministry of Agriculture.

"The work done by the Faculty of Agriculture during the last quarter of a century represents an important and significant part of the contribution wh ch the University has made to the advancement o. Ulster. From small beginnings the Faculty has grown until its fine buildings, spacious as they are, have become too small.

"The Robertson Memorial Fund will be administered by the University. Its purpose is to provide the income necessary for a memor al lecture to be delivered annually in Ulster by some eminent agricultural authority.

"Much has been written on Scott Robertson's research work on phosphates and on the mineral requirements of farm animals. As Dean o. the Faculty of Agriculture he was an inspiring leader, and many of his former students have attained fame throughout the British Empire and the world.

"Between the Faculty and the farmer of Ulster there are the closest personal contacts. Research workers will analyse the soil on a farm, advise the farmer on the treatment of his fields and the nutrition of his animals, and place at his disposal the fac lities of the seed testing station and the results of grassland experiments. The whole work of the Faculty reflects Scott Robertson's belief in agricultural education and the need for applying scientific knowledge to agricultural practice."

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THE BRITISH ASSOCIATION

Next year the British Association for the Advancement of Science will meet at Birmingham from August 30th to September 6th. The following are the appointments to the various offices in the Association:—

President: Sir Harold Hartley, F.R.S. General Treasurer: Mr. M. G Bennett. General Secretaries: Dr. Edward Hindle, F.R.S.; Sir Richard Southwell, F.R.S.

Presidents of Sections: Professor E. H. Neville (physics and mathematics); Professor E. L. Hirst, F.R.S. (chemistry); Dr. W. Campbell Smith (geology); Dr. V. B. Wigglesworth, F.R.S. (zoology); Professor S W. Wooldridge (geography); Professor G. C. Allen (economics); Professor Andrew Robertson, F.R.S. (engineering); Dr. R. N. Salaman, F.R.S. (anthropology and archaeology); Professor R. J. Brocklehurst (physiology); Dr. J. C. Flugel (psychology); Dr. W. B. Turrill (botany); Mr. W. F. Okeshott (education); Professor H. D. Kay, F.R.S. (agriculture). Local Patron: The Lord Mayor of Birmingham. Chairman of the local Executive Committee: Sir Raymond Priestley.

PIG RECORDING DEFERRED

Present-day feeding-stuffs supplies do not justify a pig recording scheme, which has had high-level consideration for some time (states *The Farmers' Weekly*).

At the N.P.B.A. Council meeting held recently in London, members decided that this was not an opportune time to launch such an undertaking. Coupled with labour difficulties, the poor volume and deficient quality of available feed constituted an obstacle which was bound to prevail pending the next February Price Review.

Following full consideration, in which a majority had urged a really effective method could only involve the weighing of all litters by Association representatives, the Council agreed that the question should be deferred. It was thought better for breeders to await the forthcoming withdrawal of the feeding-stuffs subsidy and the ensuing period necessary for the industry's readjustment.

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Tuberculosis (Attested Herds) Scheme

STATEMENT SHOWING POSITION IN EACH COUNTY AS AT SEPTEMBER 3 TH, 1949

County	Total Cattle as at 4.6.48	Number of Attested Herds as at 3 .9.49	Number of Cattle in Attested Herds as at 30.9.49	Percentage of Attested Cattle to Total Cattle
Bedford..	44,8 8	89	5,120	11·4
Berks	81,151	449	24,640	30·4
Buckingham	107,354	275	14,800	13·7
Cambridge	29,655	92	5, 40	17·0
Isle of Ely	19,638	28	1,3 0	6·6
Chester	238,541	519	24,710	10·4
Cornwall	259,545	416	14,710	5·8
Isles of Scilly	499	80	480	96·2
Cumberland	217,354	1,382	63,720	29·3
Derby	179,730	257	13,' 40	7·3
Devon	396,478	677	27,650	7·0
Dorset	144,236	633	34,150	23·7
Durham	112,818	4 4	15,440	13·7
Essex	121,985	5 7	24,850	2 ·4
Gloucester	182,9 0	5 4	27,' 60	14·8
Hampshire	139,813	740	34,930	25·0
Isle of Wight	2 ,1 3	78	3,350	16·7
Hereford	131,445	283	14,240	10·9
Hertford	57,650	254	15 240	26·4
Huntingdon	27,586	35	2 260	8·2
Kent	117,868	4 6	19,340	16·4
Lancaster	271,835	671	27 310	10·1
Leicester	154 562	186	10,180	6·6
Lincoln (Holland) ..	24,931	1	10	—
Lincoln (Kesteven) ..	65,' 25	36	1,690	2·6
Lincoln (Lindsey) ..	150,565	70	3,' 60	2·0
London	84	—	—	—
Middlesex	7,534	28	1,580	21·0
Norfolk	164,648	373	25,500	15·6
Northampton	143,457	118	7,390	4·9
Soke of Peterborough	7,117	118	7,390	4·9
Northumb rland ..	199,' 41	3 8	16,390	8·2
Nottingham	1 4 787	131	5,780	5·5
Oxford	99,661	498	25,620	25·7
Rutland	19,280	13	680	3·5
Salop	269,339	5 0	29,520	11·0
Somerset	3 9,568	9 8	45,770	14·8
Stafford..	229,962	241	11 370	4·9
Suffolk East	72,704	186	9,570	13·2
Suffolk, West	35,2 7	133	8 120	23·1
Surrey	5 ,' 92	345	14,990	29·9
Sussex East	1 5,381	399	16,190	15·4
Sussex West	7 ,44 0	3 9	14,710	2 ·8
Warwick	142,926	244	13,570	9·5
Westmorland	93,596	1,141	46,780	50·0
Wilts	186,714	480	32,390	17·3
Worcester	96.477	162	8,370	8·7
Yorks, East Riding ..	123,914	58	2 150	1·7
Yorks, North Riding ..	236,791	658	24,010	10·1
Yorks. West Riding ..	333.552	926	32,440	9·7
ENGLAND ..	6,4 0,347	17,240	821,210	12·8
Anglesey	56,187	126	4,090	7·3
Brecon	46,' 35	163	5,750	12·5
Caernarvon	61,143	224	6,750	11·0
Cardigan	73,431	3,737	56,930	77·5
Carmarthen	13 ,013	4,933	94,250	72·5
Denbigh	100,8 7	565	15 340	15·3
Flint	60.297	107	4,420	7·3
Glamorgan	72.992	216	6,060	8·2
Merioneth	41,655	991	19,160	46·0
Monmouth	67,285	181	7,490	11·1
Montgomery	94,918	440	15,780	16·6
Pembroke	98,411	1,821	39,140	39·9
Radnor	37,434	48	1,340	3·6
WALES	940,608	13,552	276,440	29·4
ENGLAND & WALES	7,340,955	30,792	1,097,650	15·0

County	Total Cattle as at 4.6.48	Number of Attested Herds as at 30.9.49	Number of Cattle in Attested Herds as at 30.9.49	Percentage of Attested Cattle to Total Cattle
Aberdeen	210,287	181	16,070	7·6
Angus	61,707	98	10 710	17·4
Argyll	61 652	530	19,350	31·4
Ayr	147 769	2,167	133 350	90·2
Banff	52,778	45	2,990	5·7
Berwick	31,583	46	3,240	10·3
Bute	10,474	331	9,650	92·2
Caithness	25,198	142	3,350	13·3
Clackmannan	4,554	28	1,910	41·9
Dumfries	98,0.6	1,369	74,430	75·9
Dunbarton	16,095	225	11,230	69·7
East Lothian	14,6 6	44	3,. 30	20·7
Fife	57,477	290	20,140	35·0
Inverness	50,741	66	3,740	7·4
Kincardine	34,808	50	4,. 90	11·8
Kinross	8,354	44	2,860	34·2
Kirkcudbright	71,365	782	51,380	72·0
Lanark	91,285	1,229	66,830	73·2
Midlothian	23,.17	187	9,530	41·4
Moray	28,218	45	3,640	12·9
Nairn	7,842	18	1,360	17·3
Orkney	46,978	96	2,930	6·2
Peebles	11,150	158	6,620	59·4
Perth	85,500	215	13,990	16·4
Renfrew	3 ,170	390	19,850	65·8
Ross-shire	37,588	40	2,150	5·7
Roxburgh	32,853	60	3,750	11·4
Selkirk	5,954	38	1,290	21·7
Stirling	40,084	367	18,830	47·0
Sutherland	9,479	80	720	7·6
West Lothian	14,663	116	6,270	42·8
Wigtown	69,699	584	47,620	68 3
Zetland	7,3 9	1,9 8	6,52.•	100·0
SCOTLAND ..	1,499,243	11,969	583,420	38·9
GREAT BRITAIN	8,84 ,198	42,761	1,681,070	19·0

• All cattle herds in Zetland are attested. This figure represents the number of animals in the last test of the herds.

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A NATIONAL POULTRY SHOW RECORD

All previous records for the National Poultry Show at Olympia, December 8th to 10th, have been broken by the receipt of well over 5,500 individual entries for the livestock section of the Show. This constitutes not only a record for any British show, restricted entirely to poultry, but is claimed to be a world record for such an event.

Penning accommodation at Olympia's National Hall allows for a maximum of 4,500 pens, and, consistent with the policy always followed at the National to stage exhibits in such a manner that they can be seen in comfort by the visiting public, the Organisers announce with regret that many of these entries will have to be rejected. First to go, must, of course, be those that arrived after the advertised closing date.

Every section will be strongly represented at Olympia, and a magnificent display of turkeys is promised—due no doubt to the Club Shows of the two largest Turkey Specialist Clubs, held in conjunction with the event.

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BRITISH HORSE SOCIETY

At the October meeting of the Council of the Society it was reported that Captain T. Lewis Wright, M.R.C.V.S., had been appointed to Council to represent the Central Veterinary Society, and that Mr. J. L. O'Connell, M.R.C.V.S., would now act as the representative of British Railways. Major C. Davenport, O.B.E., F.R.C.V.S., was re-appointed to the Pony Club Organisation Committee, as one of the Council's representatives, for a period of three years.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

OEDEMA DISEASE OF SWINE

Sir,—In support of Mr. Timony's letter suggesting the possibility of an infective agent being responsible for oedema in pigs, we have observed the following in a number of outbreaks investigated.

In the majority of outbreaks the original cases occurred in pigs between eight and 14 weeks old within a week of their arrival, usually about 50 per cent. of the batch being affected simultaneously. Further outbreaks among the home pigs may occur a week later, but not necessarily in the closest contacts. On some farms there have been several outbreaks in new pigs within a week of their arrival.

Out of ten outbreaks investigated, only two occurred primarily in pigs which had not been moved. In one of these it occurred a week after the farmer had visited the market where the pigs involved in another outbreak had originated and in the others the swill was collected from an affected farm.

There was a wide diversity in the pig husbandry and feeding methods on the various piggeries involved.

The disease has now been encountered in Oxfordshire, Hampshire, Berkshire and Northants.

Yours faithfully,

N. S. BARRON,
DEBORAH HOWELL.

Ministry of Agriculture and Fisheries,
Veterinary Investigation Department,
Upper Redlands Road,
Reading, Berks.

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CASE VISITATION *VERSUS* TREATMENT AT SURGERY

Sir,—In your issue of November 5th you publish a letter from Miss Gwynne Jones in which she questions the advisability of taking small animals to a veterinary surgery from a *client's* point of view. May I hastily point out that the conscientious practitioner is at all times concerned *only* with the welfare of his patients and their owners. From Miss Gwynne Jones's standpoint as a breeder I am reconciled to her arguments since few of us would hesitate to visit kennels where moderate help is available and the patients are disciplined and facilities exist for examining each dog in turn, but my remarks were concerned with the private owners of one or more dogs where these factors do not exist and the patient is allowed to "hoover" the veterinary surgeon from shoe to knee to his embarrassment that he may be conveying infection to his other cases. Similarly, can it be suggested that these dogs, exercised in the streets, parks, recreation grounds, etc., and allowed to consort with every other dog, do not run a greater risk than in a veterinary surgeon's waiting room which, after all, is subject to a very strict surveillance.

Yours faithfully,

E. REGINALD AMBROSE.

The Veterinary Surgery,
Princess Street, Camberley.

November 10th, 1949.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Fowl Pest	Parasitic Mange•	Sheep Scab	Swine Fever
Oct. 16th to 31st, 1949	18	—	55	—	—	—
Corresponding period in—						
1948	9	—	2	—	—	1
1947	6	—	392	—	8	2
1946	5	1	—	—	8	1
Jan. 1st to Oct. 31st, 1949	195	13	510	—	34	5
Corresponding period in—						
1948	93	2	252	1	52	25
1947	97	103	1400	1	74	31
1946	77	34	—	7	74	332

NOTE.—The figures for the current year are approximate only.

• Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free for Tuberculosis as at October 31st, 1949, was as follows:—

ENGLAND	WALES	SCOTLAND	TOTAL (GREAT BRITAIN)
17,805	13,630	12,044	43,479